

NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

ACOUSTICALLY FORCED HEAT TRANSFER FROM A TUBE BANK

by

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June 2000

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ACOUSTICALLY FORCED HEAT TRANSFER FROM A TUBE BANK

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Submitted in partial fulfillment of the
requirements for the degree of

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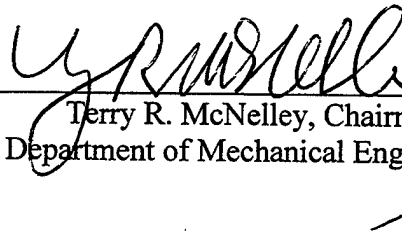


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ABSTRACT

Experimental work was carried out on the steady state heat transfer behavior from a tube bank in a zero mean oscillatory flow. The oscillatory flow across the tube bank was created by an acoustic field inside an isolated resonant chamber. The transverse tube bank arrangement was represented by smooth walled cylinders placed parallel to each other, with the plane of the cylinders normal to the direction of fluid oscillation, similar to the arrangement found in many heat exchangers. The spacing between the cylinders was varied to examine the effects of boundary layer interference on the heat transfer behavior. Heat transfer correlations were developed in the form of Nusselt number as a function of the streaming Reynolds number for each tube spacing. This experimental study is relevant to the design of heat exchangers for thermoacoustic engines.

TABLE OF CONTENTS

I. INTRODUCTION	1
II. BACKGROUND.....	3
A. ACOUSTIC FIELDS	3
B. THERMOACOUSTIC REFRIGERATION.....	4
C. BOUNDARY LAYERS	6
III. EXPERIMENT	9
A. INTENT	9
B. DIMENSIONLESS PARAMETERS	9
1. Cylinder Length Scale	10
2. Amplitude Parameter	11
3. Frequency Parameter	11
4. Interference Parameter.....	12
5. Streaming Reynolds Number.....	13
C. APPARATUS	14
1. Sound Chamber	14
2. Tube Bank.....	15
3. Electronic Instruments Package.....	16
D. PROCEDURE.....	19
IV. RESULTS AND DISCUSSION.....	23
V. CONCLUSIONS AND RECOMMENDATIONS	31
APPENDIX.....	33
A. SAMPLE CALCULATIONS	33
1. Nusselt Number	33
2. Streaming Reynolds Number.....	34
B. UNCERTAINTY ANALYSIS	35
1. Nusselt Number	35
2. Streaming Reynolds Number.....	35
C. EXPERIMENTAL DATA.....	37
LIST OF REFERENCES	85
INITIAL DISTRIBUTION LIST	87

LIST OF FIGURES

1. Resonate Standing Acoustic Wave in an Isolated Chamber	4
2. Thermoacoustic Refrigerator	6
3. Heat Exchanger	7
4. Boundary Layers on Cylinders in Cross Flow	8
5. Experimental Sound Chamber	14
6. Tube Bank	15
7. Heater Circuit	17
8. Instruments Schematic	18
9. Photograph of Experimental Apparatus	18
10. Geometry for Maximum Velocity at Tube Bank	20
11. Nusselt Number vs. Streaming Reynolds Number for $S_T/d=1.5$	25
12. Nusselt Number vs. Streaming Reynolds Number for $S_T/d=1.75$	26
13. Nusselt Number vs. Streaming Reynolds Number for $S_T/d=2.0$	27
14. Nusselt Number vs. Streaming Reynolds Number for all $\phi>1$	28
15. Nusselt Number vs. Streaming Reynolds Number for $ST/d=1.25$	30

LIST OF TABLES

1. Resonate Frequencies Used	19
2. Parameter Ranges Used	23
3. Correlation Data for $\varphi > 1$	25

LIST OF SYMBOLS

χ	cylinder compactness parameter
δ	boundary layer thickness [m]
ΔT	temperature difference [K]
ε	amplitude parameter
γ	specific heat ratio
ϕ	interference parameter
λ	wavelength [m]
λ_R	radian wavelength [m]
Λ	frequency parameter
ν	kinematic viscosity [m ² /s]
ω	radian frequency [rad/s]
ζ	surface-to-surface tube bank spacing [m]
A_H	heater cross sectional area [m ²]
c	speed of sound [m/s]
d	cylinder diameter [m]
f	frequency [Hz]
G	amplitude gain
G_R	Grashoff number
h	convection heat transfer coefficient [W/m ² K]
I_H	heated cylinder current [A]
I_R	resistor current [A]
k_{air}	thermal conductivity of air [W/mK]
L	tube-bank to chamber-end distance [m]
L_H	heated cylinder length
Nu_d	Nusselt number based on diameter
P_m	mean ambient pressure [Pa]
P_o	pressure level [Pa]
Pr	Prandtl number
Q_H	heated cylinder power [W]
r	cylinder radius [m]
R_{air}	gas constant for air [J/kg K]
R_R	resistor resistance [Ω]
R_S	Streaming Reynolds number
S	transducer sensitivity [mV/psi]
S_T	center-to-center tube bank spacing [m]
T_A	ambient temperature [K]
T_{avg}	average fluid temperature [K]
T_H	heated cylinder temperature [K]
V_H	heated cylinder voltage [V]
V_{mic}	transducer voltage [mV]
V_R	resistor voltage [V]

I. INTRODUCTION

The influence of sound waves in the transfer of heat is a relatively new science. A recent application of acoustic heat transfer is relevant to the design of heat exchangers for thermoacoustic engines/refrigerators. Unlike the vapor cycle refrigerators in widespread use today, thermoacoustic refrigeration does not involve the use of chloroflourocarbons (CFCs) that are potentially harmful to the ozone layer in the atmosphere. Additionally, thermoacoustic refrigerators do not contain many moving parts, which can substantially reduce maintenance costs. Thermoacoustic refrigeration uses sound waves to remove heat from the refrigerated space to produce the cooling effect. Unlike uniform flow, however, there is little data available to quantify the heat transfer exchange with bodies in an oscillating flow.

In order to make the commercial use of the thermoacoustic refrigerator an eventual reality, it must be economically competitive with conventional vapor cycles. At present, thermoacoustic refrigeration is less efficient than conventional cooling. Designing effective heat exchangers for use in an acoustic field is a crucial step in making these refrigerators more efficient. To accomplish this, experimental data must be collected to correlate the heat transfer rate from a heat exchanger to the acoustic field characteristics so as to allow a more knowledgeable design.

Wheatley et al. (1983) and Atchley et al. (1990) have performed detailed experiments to examine the heating/cooling thermoacoustic effect produced by a standing acoustic wave. Raney et al. (1954), Westervelt (1960), and Nyborg (1965) have developed theory for the behavior of acoustic streaming flow around isolated bodies. Mozurkewich (1995), and Gopinath and Harder (2000), have performed heat transfer

experiments with an isolated cylinder in an oscillating flow. Correlations to relate the dimensionless parameters important to heat transfer, namely the Nusselt Number (Nu_d) as a function of the Streaming Reynolds Number (Re_s) were found by Gopinath and Harder (2000). Common heat exchanger designs, however, usually consist of not a single isolated cylinder, but several tubes arranged in various geometries. One common geometry is a bank of tubes in a transverse arrangement, i.e. placed with its plane normal to the direction of flow – it is this particular geometry which forms the subject of study in this thesis. Depending on the distance between the tubes, the boundary layers formed on the surface of the tubes by the oscillating flow may interfere with each other and have a deleterious affect on the heat transfer rate. It would be beneficial then, to determine the extent of this interference so that heat exchanger design could incorporate this influence.

This experimental work involves the correlation of the Nusselt number to the streaming Reynolds number for a transverse bank of cylindrical tubes subjected to an acoustic field. A high power, standing, resonant wave is generated in an isolated chamber by an acoustic compression driver. The resulting oscillating cross flow is used to remove heat from a heated cylinder with unheated or “dummy” cylinders placed alongside it to simulate the various neighboring tubes as in a heat exchanger bank. The data required to calculate the Nusselt number and streaming Reynolds number are gathered using various electronic instruments. The uniform spacing between the cylinders is parametrically varied so that the resultant effect of the boundary layer interference on the heat transfer can also be determined.

II. BACKGROUND

A. ACOUSTIC FIELDS

Classical fluid dynamics and convective heat transfer studies have for obvious reasons focused most attention on uniform fluid flows, i.e. flows which do not reverse direction, let alone do so in a rapid and repetitive manner as in an acoustic field. The fluid is put into motion by some force, such as a fan, pump, or atmospheric wind. The moving fluid then transfers heat into, or away from, a surface, and is then carried away. A common example is the air flowing through the finned passages of the radiator of an automobile. This situation could be modeled as a uniform flow of cool air at a velocity approximately equal to the speed of the vehicle, flowing across finned tubes carrying hot engine coolant.

Oscillating flow, on the other hand, is a situation in which the fluid flow direction changes continuously back and forth. The fluid velocity has a zero mean since the amplitudes of oscillation in both directions are equal, but their directions are opposite. There is no net movement of the fluid over time. However, there can still be heat transfer in an oscillating flow because convection occurs due to the basic motion of the fluid, regardless of the fluid direction. Heat transfer from an oscillating flow has been studied more and more frequently in the latter half of the twentieth century, as reviewed for instance by Richardson (1967).

In an acoustic sound field, an acoustic driver vibrates and causes the fluid oscillation. If a resonant field is isolated inside a chamber, such as a plane-ended cylinder, the field will have a standing wave distribution, i.e. sinusoidally varying

pressure and velocity distributions that are 90 degrees out of phase with each other. A pressure antinode, or maximum, is created at the planar rigid end termination of the chamber where the velocity is zero from the no-slip boundary condition. This situation is illustrated in Figure 1. Since the pressure and velocity fields are 90 degrees out of phase (like the sine and cosine functions), the pressure will ideally be at an antinode where the velocity is at a node, and vice versa. This characteristic has major implications as far as heat transfer is concerned, as will be discussed later.

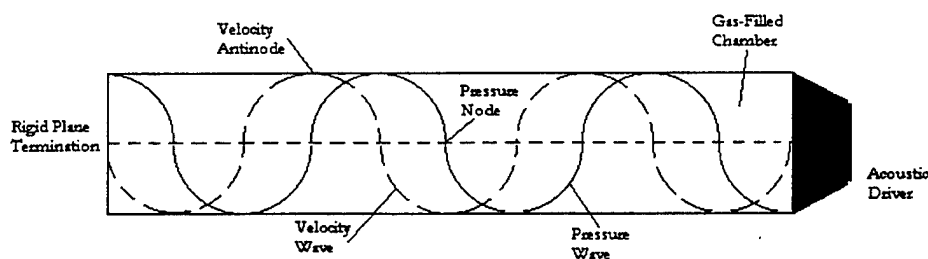


Figure 1: Resonate Standing Acoustic Wave in an Isolated Chamber

B. THERMOACOUSTIC REFRIGERATION

A temperature gradient along a tube can cause pressure oscillations in the fluid along the tube surface, which can create audible sound under the right circumstances. The basic principle behind thermoacoustic refrigeration is the fact that this process can also be

reversed, i.e an acoustic field under the right circumstances can be used to create a thermal effect. Garrett and Hofler (1992), and Swift (1995), describe thermoacoustic refrigeration in detail. The simplified model in Figure 2 depicts a basic thermoacoustic refrigerator. A stack of thin plates with low thermal conductivity is placed at a specific location within an isolated sound chamber. An acoustic driver at one end oscillates the gas (typically air or a low Prandtl number gas mixture) inside the chamber. The fluid oscillates between high and low pressure locations inside the tube. According to classical thermodynamics, as a gas particle is compressed in a high-pressure region, its temperature increases. It will therefore give heat off to the stack at that location. As it oscillates back to a low-pressure region and expands, its temperature decreases, and it removes heat from the stack at that location. A heat exchanger at each end of the stack is where the stack's temperature gradient is utilized for refrigeration. Essentially, sound is the mechanical energy that serves to pump heat from the cold exchanger to the hot exchanger. The magnitude of the temperature gradient along the stack increases as the pressure ratio of the fluid oscillation increases.

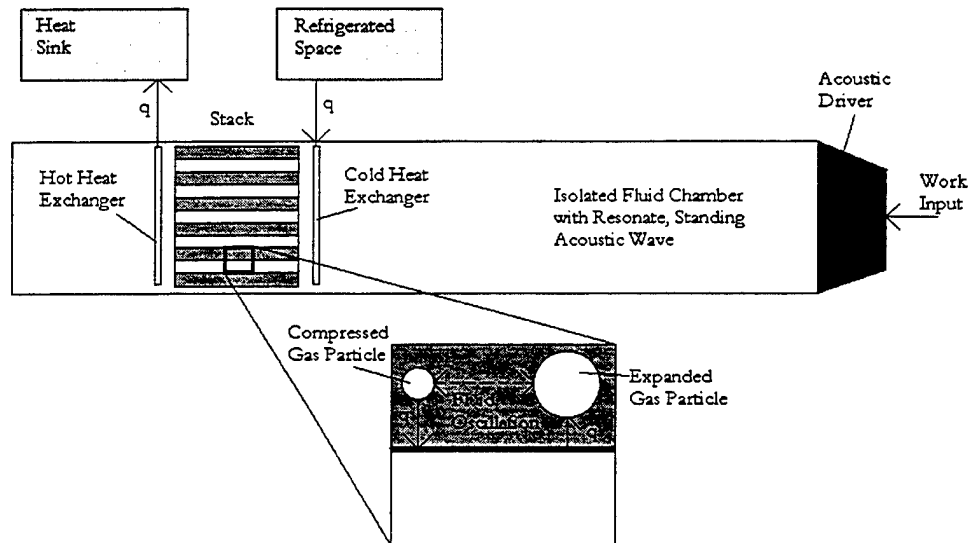


Figure 2: Thermoacoustic Refrigerator

C. BOUNDARY LAYERS

To utilize the temperature gradient along the stack, heat exchangers must be able to transfer heat away from the low temperature end of the stack to the high temperature end. These heat exchangers must be able to do this as efficiently as possible if a large temperature gradient is to be obtained.

In convective heat transfer with a uniform flow, a higher fluid velocity will generally mean a higher convective heat transfer coefficient (h). The same is true in an oscillating fluid flow. It would seem logical, therefore to place the heat exchangers at pressure nodes, where the velocity is at a maximum. This condition may require that a gap in physical contact exist between the stack and the heat exchanger. It is therefore all the more important for the heat exchanger to be efficient.

The most common heat exchanger designs utilize several cylinders placed parallel and in line, with their plane perpendicular to the cross flow of the fluid. Garrett et al. (1994) have provided a preliminary heat exchanger design based however on the

principles of conventional mean flow analysis. Figure 3 shows a common heat exchanger tube bank type arrangement.

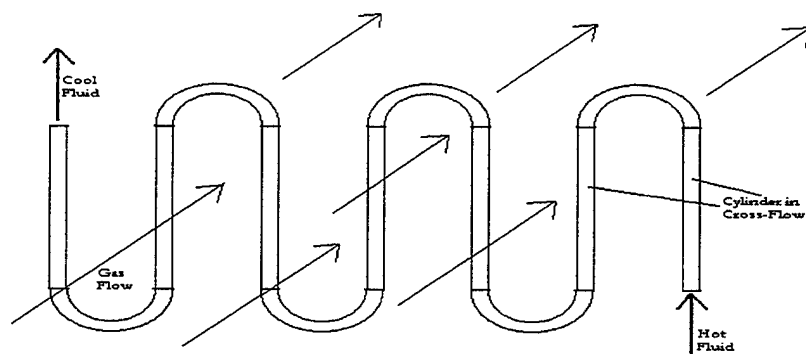


Figure 3: Heat Exchanger

If the parallel cylinders in a flow are close enough to each other, the boundary layer flow formed around each cylinder could interfere with the boundary layer on the adjacent cylinders. Figure 4 shows this situation. For this boundary layer interference to occur, the boundary layer thickness, (δ), must be at least half of the distance between the cylinders, (ζ). Therefore,

$$2\delta \geq \zeta$$

is the requirement for boundary layer interference to occur. In oscillating flows, δ depends on several parameters, including the frequency of fluid oscillation, as will be discussed later. If boundary layer interference occurs, the convective heat transfer coefficient between the cylinder and the fluid may be adversely affected. The heat transfer from a bank of cylinders may therefore deviate from the heat transfer from an isolated cylinder thus resulting in reduced performance effectiveness.

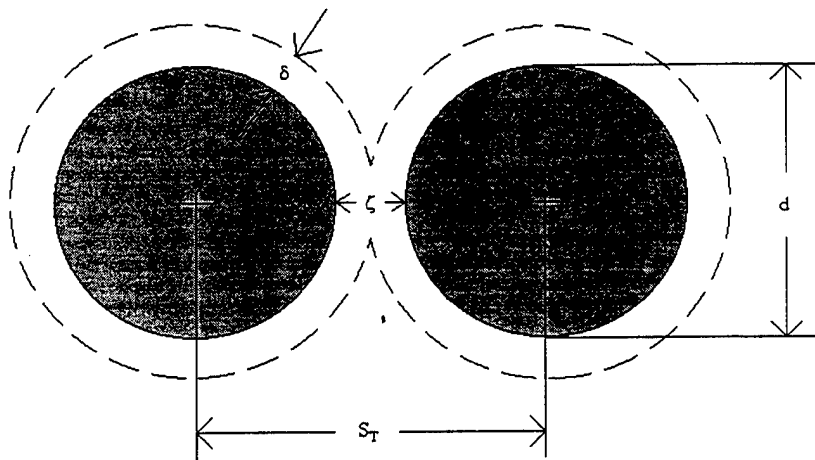


Figure 4: Boundary Layers on Cylinders in Cross Flow

Depending on design constraints, it may become necessary to place the tubes of a heat exchanger close enough to each other so that this boundary layer interference could become an issue. If this is the case, the quantitative influence of boundary layer interaction on the convective heat transfer coefficient would need to be known in order to more effectively design a heat exchanger for a thermoacoustic refrigerator. Finding this affect of boundary layer interference on the convective heat transfer coefficient is the ultimate goal of this experimental study.

III. EXPERIMENT

A. INTENT

Since a bank of cylindrical tubes may have a boundary layer interference effect on its convective heat transfer coefficient, direct extrapolation of experimental results for an isolated cylinder may not be realistic. This experiment is designed to examine the effects of spacing between the cylinders of a tube bank. A long cylindrical sound chamber was chosen for this experiment because it helps to restrict the sound waves to only the longitudinal direction of motion, thus preventing the occurrence and interference of transverse waves. Additionally, the sound chamber resembles the structure of a thermoacoustic engine, which is the practical application for which this experiment is intended.

B. DIMENSIONLESS PARAMETERS

In order to link one experimenter's results to another's, and to be able to apply results to a wide variety of situations other than the experiment itself, dimensionless parameters are necessary. Common convective heat transfer correlations for uniform flow over bluff bodies have long used such parameters as the Reynolds, Nusselt, Prandtl, and Grashof numbers. Oscillating flow is more complicated, however, and additional dimensionless parameters are necessary to fully describe the flow. Richardson (1967) gives a detailed derivation of these parameters.

1. Cylinder Length Scale

In order to assume that the flow around the tube bank is incompressible, the radian wavelength of the acoustic field must be large compared to the characteristic length of the cylinder. This characteristic length is chosen as the cylinder's diameter, d , and the radian wavelength, λ_R , is defined as

$$\lambda_R = \frac{\lambda}{2\pi} = \frac{c/f}{2\pi} = \frac{c}{\omega} \quad (1)$$

The requirement is that

$$\frac{d}{\lambda_R} \ll 1 \quad (2)$$

So χ is defined as the ratio of the characteristic length of the cylinder to the radian wavelength

$$\chi = \frac{d}{\lambda_R} = \frac{d\omega}{c} \ll 1 \quad (3)$$

By ensuring this requirement, Lighthill (1963) showed that radiation effects due to acoustic streaming are very small and can be neglected, making only the acoustic field important.

2. Amplitude Parameter

Another dimensionless parameter of importance is ε , defined as the ratio of the displacement amplitude of particle oscillation to the characteristic body length. After manipulation, ε can be expressed in terms of the pressure ratio of oscillation as shown by Gopinath and Harder (2000):

$$\varepsilon = \frac{c}{d\omega\gamma} \left(\frac{P_o}{P_m} \right) \quad (4)$$

If ε is small compared to unity, the flow will remain attached to the cylinder and will be laminar. If ε becomes greater, the flow will shed from the cylinder.

3. Frequency Parameter

A frequency parameter, Λ^2 , is defined as follows:

$$\Lambda^2 = \frac{d^2\omega}{\nu} \quad (5)$$

Gopinath and Harder (1999) showed that if Λ^2 is much greater than unity, the Stokes shear layer is confined to a narrow region and the acoustic streaming effect appears as slip velocity along the cylinder surface.

4. Interference Parameter

For cylinders arranged with axes parallel and with uniform separation, let S_T be the center to center distance between the cylinders. Then the distance between the outer edges of the cylinders at their closest point, ζ , is therefore

$$\zeta = S_T - 2r = S_T - d \quad (6)$$

Riley (1965) and Stuart (1966) showed that the boundary layer thickness, δ , of the steady streaming flow generated on the cylinder at its thickest is given by:

$$\delta = 10 \sqrt{\frac{\nu}{\omega}} \quad (7)$$

which is used here as the separation distance criterion for interference between the boundary layers. For parallel cylinders, boundary layer interference will occur if

$$\frac{\zeta}{2\delta} < 1 \quad (8)$$

Substituting the approximation for δ and squaring both sides, it follows that

$$\frac{\zeta^2 \omega}{400\nu} < 1 \quad (9)$$

is the requirement for boundary layer interference. This is called the interference parameter, ϕ , and can also be expressed in terms of other parameters

$$\phi = \frac{\zeta^2 \omega}{400\nu} = \frac{d^2 \left(\frac{S_T}{d} - 1 \right)^2 \omega}{400\nu} = \frac{\Lambda^2 \left(\frac{S_T}{d} - 1 \right)^2}{400} \quad (10)$$

Boundary layer interference will occur if $\phi < 1$.

5. Streaming Reynolds Number

The Reynolds number is a familiar dimensionless parameter in fluid dynamics and convective heat transfer. In oscillating flow, however, the parameter is modified to include the frequency and pressure ratio. Stuart (1966) and Riley (1966) found that both the frequency and amplitude parameter are necessary to define a suitable Reynolds number. The streaming Reynolds number, R_S , is defined as

$$R_S = \varepsilon^2 \Lambda^2 = \frac{c^2}{\omega \nu \gamma^2} \left(\frac{P_o}{P_m} \right)^2 \quad (11)$$

For buoyancy effects to be negligible, Gopinath and Harder (1999) showed

$$\frac{R_S^2}{G_R} \gg 1 \quad (12)$$

This criterion ensures that free convection is small compared to forced convection.

C. APPARATUS

The equipment utilized in this experiment consists of three main assemblies: the sound chamber, the tube bank, and the instruments used for data collection.

1. Sound Chamber

A long cylindrical tube is used to obtain a standing, resonant, isolated acoustic wave. The chamber is made of transparent plexi-glass. The inside diameter is 3" (~76mm), and the wall thickness is 1/4" (~6mm). The length of the chamber is 2m. The Chamber is supported by eight stations along its length, connected to a plexi-glass base plate. At one end of the chamber is the acoustic driver, and at the other end is an adjustable endplate that allows the length of the tube to be varied. The end plate makes an airtight seal to the inside chamber wall with a rubber O-ring. Figure 5 shows the sound chamber. The acoustic driver is a JBL® Model 2490H midrange compression driver with 8Ω impedance and a frequency range of 250Hz to 2.5kHz.

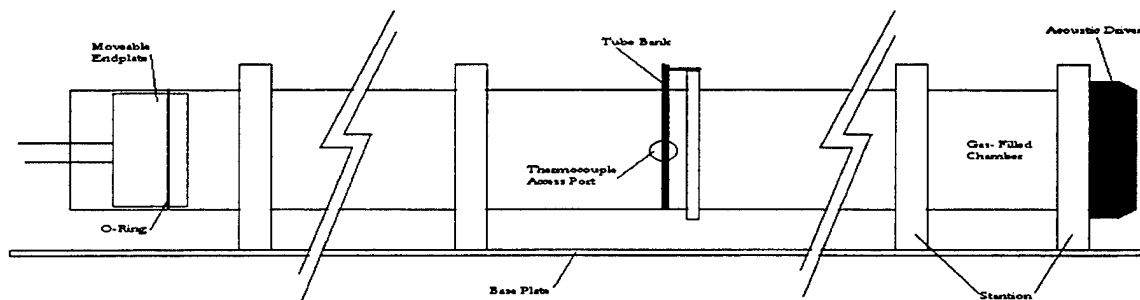


Figure 5: Experimental Sound Chamber

2. Tube Bank

The tube bank consists of a central heated cylinder and two “dummy” cylinders on each side of it. The heated cylinder is a smooth surfaced Watlow® cartridge heater with a 1/8” diameter. In addition to the internal heating element, the heater contains a type J thermocouple to measure the surface temperature of the cylinder. When inside the sound chamber, the cylinder length to diameter ratio is ~24, which ensures that end effects can be considered negligible for heat transfer calculations. The “dummy” cylinders are smooth 1/8” diameter brass tubes. The cylinders are put into the sound chamber through oblong grooves cut through the chamber’s top and bottom surfaces. The grooves allow the spacing between the cylinders, S_T , to be varied. The tubes are held in place by an aluminum plate fastened to the outside of the chamber. Figure 6 shows the tube bank arrangement. In order to ensure that the sound chamber is sealed and isolated from the outside air, Silly Putty® is used to fill the grooves around the cylinders.

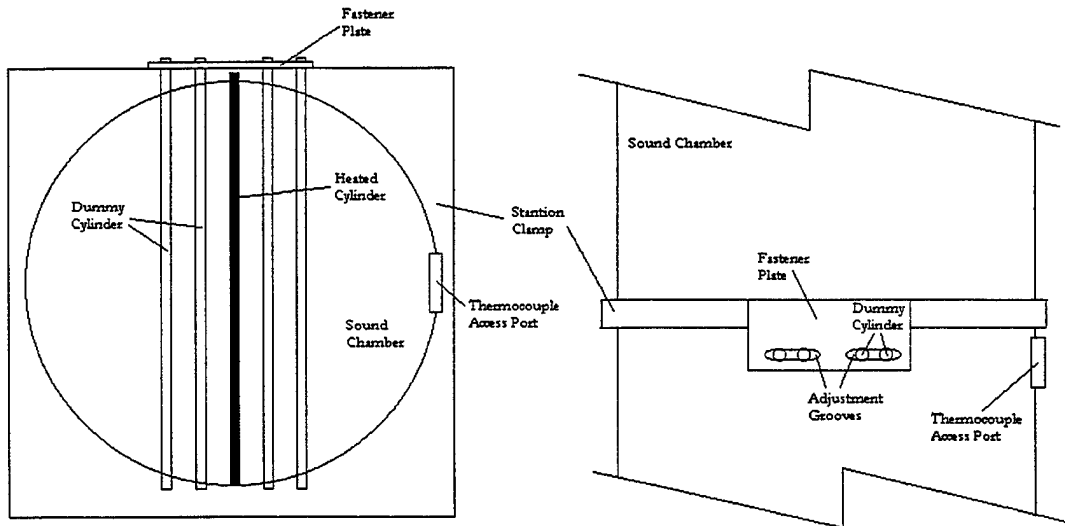


Figure 6: Tube Bank

3. Electronic Instruments Package

A Hewlett Packard® 33120A variable waveform generator is used to power the acoustic driver with a sinusoidal signal at the desired frequency. Prior to being input to the acoustic driver, the signal is amplified by a Techtron® 7540 power amplifier.

The adjustable endplate of the sound chamber was fitted with an Endevco® model 8510B-5 pressure transducer. The transducer's sensitivity, S , is 50.89mV/psi. The transducer output goes to a pre-amp with a gain, G , of 100, which gives an amplified gain of 5089mV/psi. The pre-amp then is input into a Hewlett Packard® 3562A dynamic signal analyzer. The signal analyzer allows the output from the pressure transducer, V_{mic} , to be observed in both time domain and power spectrum outputs. Using the power spectrum output, the pressure ratio of the resonant wave inside the chamber can be calculated as follows

$$\frac{P_o}{P_m} = \frac{V_{mic} / SG}{P_m} \quad (13)$$

Where P_m is the mean atmospheric pressure of 14.7psi, and P_o is the difference between the maximum pressure in the sound chamber (which occurs at pressure antinodes, or velocity nodes) and P_m . The power spectrum also allows disturbances from harmonics and other sources to be observed so that they can be minimized.

The power to the heated cylinder is supplied by a Kikusui® model PAR 160A regulated DC power supply. To measure the power to the heater, the voltage drop across it and the current running through it are measured. A Hewlett Packard® 34401A digital

multimeter is placed in parallel with the heater to measure the voltage across it, V_H . The current through the heater, I_H , is calculated by measuring the voltage drop across a resistor of known resistance, R_R , and applying Ohm's law

$$I_H = I_R = \frac{V_R}{R_R} \quad (14)$$

Figure 7 is the electrical circuit used to calculate the power to the heated cylinder.

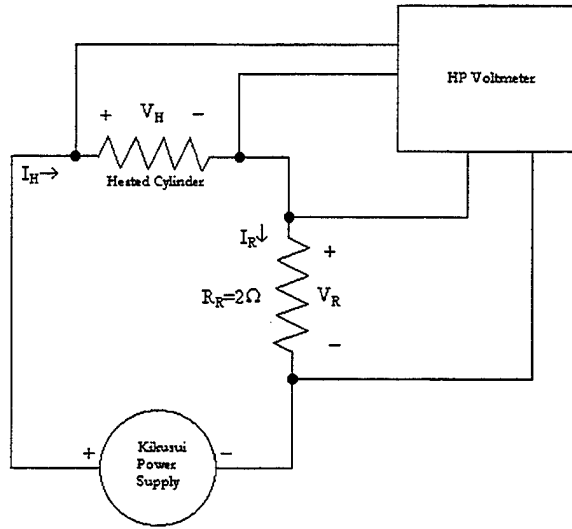


Figure 7: Heater Circuit

Finally, a Keithley® 740 system-scanning thermometer is used to measure the heated cylinder surface temperature and the ambient fluid temperature. As stated earlier, the heater is supplied with an internal type J thermocouple. The ambient temperature is taken with a type E thermocouple inside a small probe. The probe is inserted into the

sound chamber via a removable access port in the side of the chamber. The thermometer can be toggled between the thermocouples to record both temperatures.

Figure 8 shows the schematic of the instruments used in the experiment. Figure 9 is a photograph of the experimental apparatus.

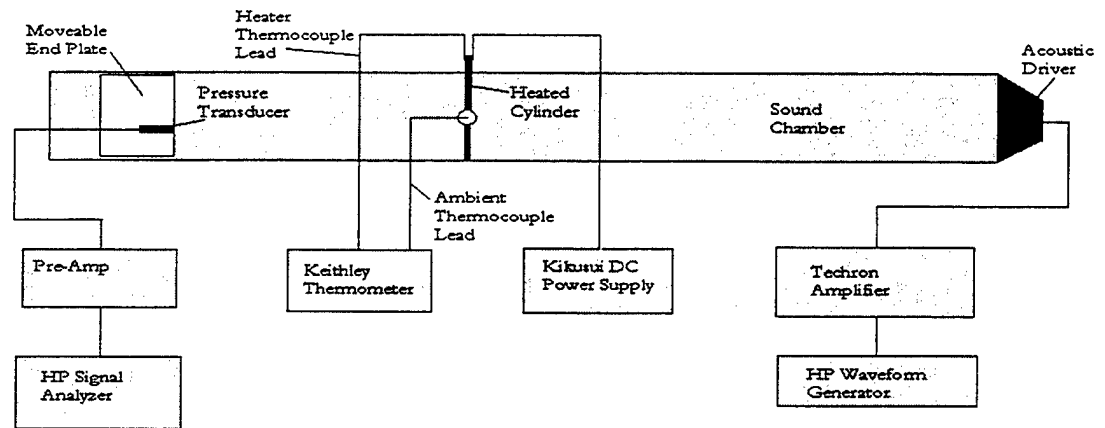


Figure 8: Instruments Schematic

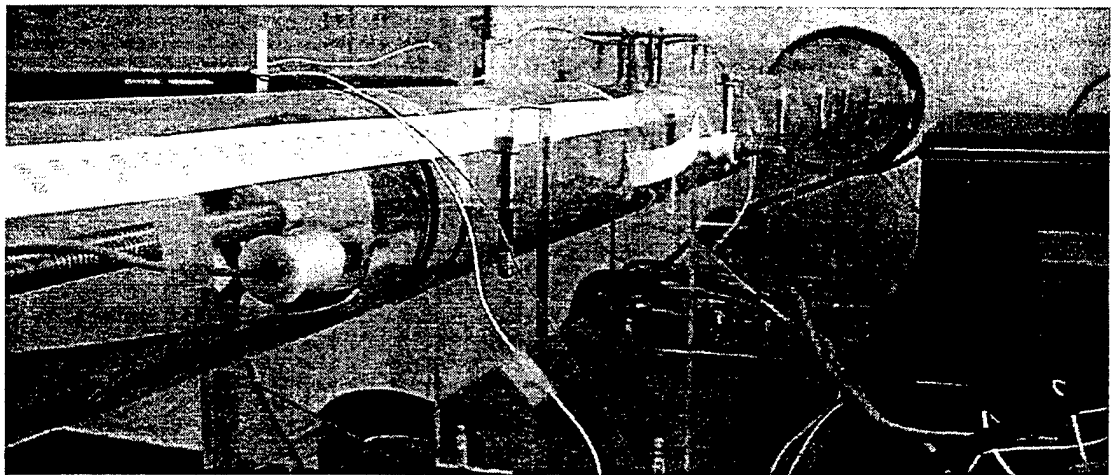


Figure 9: Photograph of Experimental Apparatus

D. PROCEDURE

Before data “runs” could begin, frequencies and corresponding chamber lengths had to be found that would set up a resonant, standing wave inside the chamber with a velocity antinode at the tube bank location. From Figure 10, it is obvious that the distance L must be an odd multiple of $\lambda/4$. Put another way,

$$n = \frac{4Lf}{c} \quad (15)$$

and n must be an odd integer. To accomplish this, a pressure transducer was placed at the chamber surface at the location of the tube bank. The acoustic driver was then powered with an arbitrary frequency, and an arbitrary tube length. The frequency was adjusted until V_{mic} was at a minimum. Next, n was calculated to see if it was indeed an odd integer. If not, the chamber length was adjusted by moving the endplate and the process was repeated. In all, 6 resonant frequencies were found. These frequencies are listed in Table 1.

f (Hz)	L (m)	n	$\max P_o/P_m$ (%)
383	0.24	1.069	~3.3
676	0.65	5.109	~3.1
723	0.6	5.044	~3
925	0.65	6.991	~2.8
1202	0.65	9.085	~2
1461	0.65	11.04	~1.3

Table 1: Resonate Frequencies Used

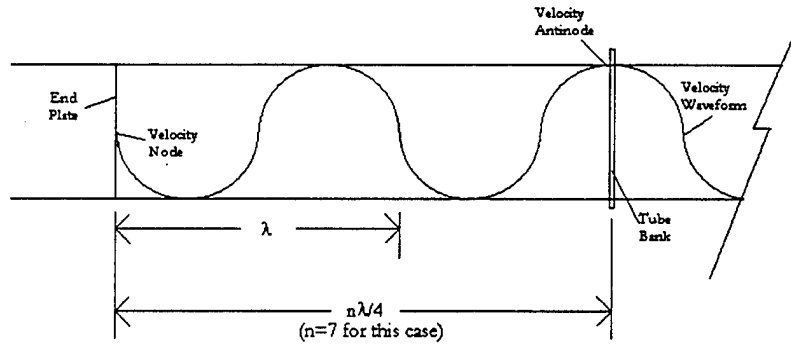


Figure 10: Geometry for Maximum Velocity at Tube Bank

Once the frequencies are identified, it is necessary to determine the maximum possible pressure ratio for each frequency, without too much interference from harmonics and other sources. This is done by observing the power spectrum. Since the first harmonic of the frequency, $2f$, is out of phase with the primary signal, it will not interfere. However, the second harmonic, $3f$, is in phase and will therefore interfere with the primary signal. The pressure ratio was increased until the transducer voltage from the second harmonic was 5% of the primary signal. This value of 5% interference was taken as the cutoff for the maximum pressure ratio. The maximum pressure ratio for each frequency is listed in Table 1.

After the resonant frequencies and the maximum possible pressure ratios were found, the data collection could begin. The first step was to set the tube bank spacing. Four values of S_T/d were used in this experiment; 1.25, 1.5, 1.75, and 2.0. The spacing

was measured to .001" using calipers. After the spacing was set, the tubes were inserted into the chamber and sealed with putty.

Once the spacing was set, the data collection could begin. First, the power to the heated cylinder was engaged. The heater would then begin to rise in temperature, which was monitored by the thermometer. Next, the acoustic driver was powered by turning on the power amplifier. The power to the driver was increased until the temperature of the heater would level off and attain a steady state value. If the pressure ratio of the driver was too small, the heater would continue to rise in temperature. If the pressure ratio was too large, the heater temperature would begin to decrease. Once a steady state temperature was achieved, the data was recorded. V_{mic} was recorded first, then V_H and V_R . The steady state temperature of the heater, T_H , was recorded, then the power to the driver and the power to the heater were simultaneously disengaged. The ambient thermocouple probe was then inserted into the chamber and the ambient temperature recorded. This completed the data collection for one data point. For each frequency, at each tube spacing, twenty data points were taken. The voltage across the heater was then raised slightly and the process repeated.

Once the data was collected, the Nusselt number and Streaming Reynolds Number were calculated using a computer spreadsheet. The Nusselt number, Nu_d , is defined as

$$Nu_d = \frac{hd}{k_{air}} \quad (16)$$

Where the convective heat transfer coefficient, h , is defined as

$$h = \frac{Q_H}{A_H(\Delta T)} \quad (17)$$

The power to the heater is

$$Q_H = I_H V_H = \frac{V_R}{R_R} V_H \quad (18)$$

Additionally,

$$A_H = \pi d L_H \quad (19)$$

$$(\Delta T) = T_H - T_A \quad (20)$$

Using Eqns. (16) through (20), Nu_d was calculated by

$$Nu_d = \frac{V_R V_H}{\pi R_R L_H (T_H - T_A) k_{air}} \quad (21)$$

The values of ϵ , χ , Λ^2 , ϕ , and R_s were then calculated as described previously. The speed of sound, the kinematic viscosity, and k_{air} were calculated at the average fluid temperature

$$T_{avg} = \frac{T_H + T_A}{2} \quad (22)$$

IV. RESULTS AND DISCUSSION

A total of over 450 individual data points were calculated for the six frequencies and four tube spacing values as described in the previous chapter. Table 2 shows the ranges of the different dimensionless parameters covered during the experiment.

Parameter	min	max
epsilon	0.01	1
x	0.02	0.08
Λ^2	1500	5900
phi	0.2	15
Po/Pm	0.50%	3.30%
Rs	<10	1500

Table 2: Parameter Ranges Used

For values of $\phi > 1$, the results replicate those of an isolated cylinder (to within experimental error). Although this conclusion might have been expected since there is no boundary layer interference anticipated in this regime, it nonetheless provides a firm corroboration with the earlier single cylinder results of Gopinath & Harder (2000). For “low” values of R_S the relationship between Nu_d and R_S is expected to be of the form

$$Nu_d = Y Pr^x R_S^{0.5} \quad (23)$$

which exemplifies the laminar, attached flow regime. This low-amplitude attached and laminar behavior of the flow has also been demonstrated by Sarpkaya (1986) in an independent context, i.e. on the basis of force measurements on a cylinder in an

oscillatory flow. Since Pr is constant throughout this heat transfer experiment ($Pr_{air}=0.7$), it can be included in the constant Y and the relationship becomes

$$Nu_d = CR_s^{0.5} \quad (24-a)$$

Gopinath and Harder (2000) found that at larger values of R_s , the data has a steeper trend, roughly proportional to $R_s^{0.75}$ which may be attributable to vortex shedding resulting from flow instabilities. For R_s values >500 , the data was correlated using the form

$$Nu_d = CR_s^{0.75} \quad (24-b)$$

Table 3 shows the values of the constant C in Eqns. (24-a) and (24-b), correlated using a transition of $R_s=500$. Figures 11-13 are logarithmic plots of Nu_d vs. R_s for S_T/d values of 1.5, 1.75, and 2.0, respectively. Best-fit lines are constructed from Eqns. (24-a) and (24-b). Error bars from an uncertainty analysis (Appendix C) are included for arbitrary data points. Figure 14 is a plot of Nu_d vs. R_s for all data corresponding to $\phi > 1$.

Davidson (1973) predicted a correlation of $Nu_d=1.05R_s^{0.5}$ for the attached flow regime, while Gopinath and Harder (2000) found the leading coefficient to be 0.90. For “large” values of R_s , Gopinath and Harder (2000) have suggested that the correlation should be $Nu_d=0.20R_s^{0.75}$. Table 3 also includes the percentage deviation of the current experiment from these previous correlations.

ST/d	Rs<500			Rs>500	
	C	%Dev from Davidson	% Dev. From G&H	C	% Dev. From G&H
1.50	1.08	3	20.1	0.218	8.95
1.75	0.91	-13.4	1.1	0.192	-3.8
2.00	1.14	8.7	26.8	0.219	9.55
all	1.08	3	19.8	0.203	1.35

Table 3: Correlation Data for $\phi > 1$

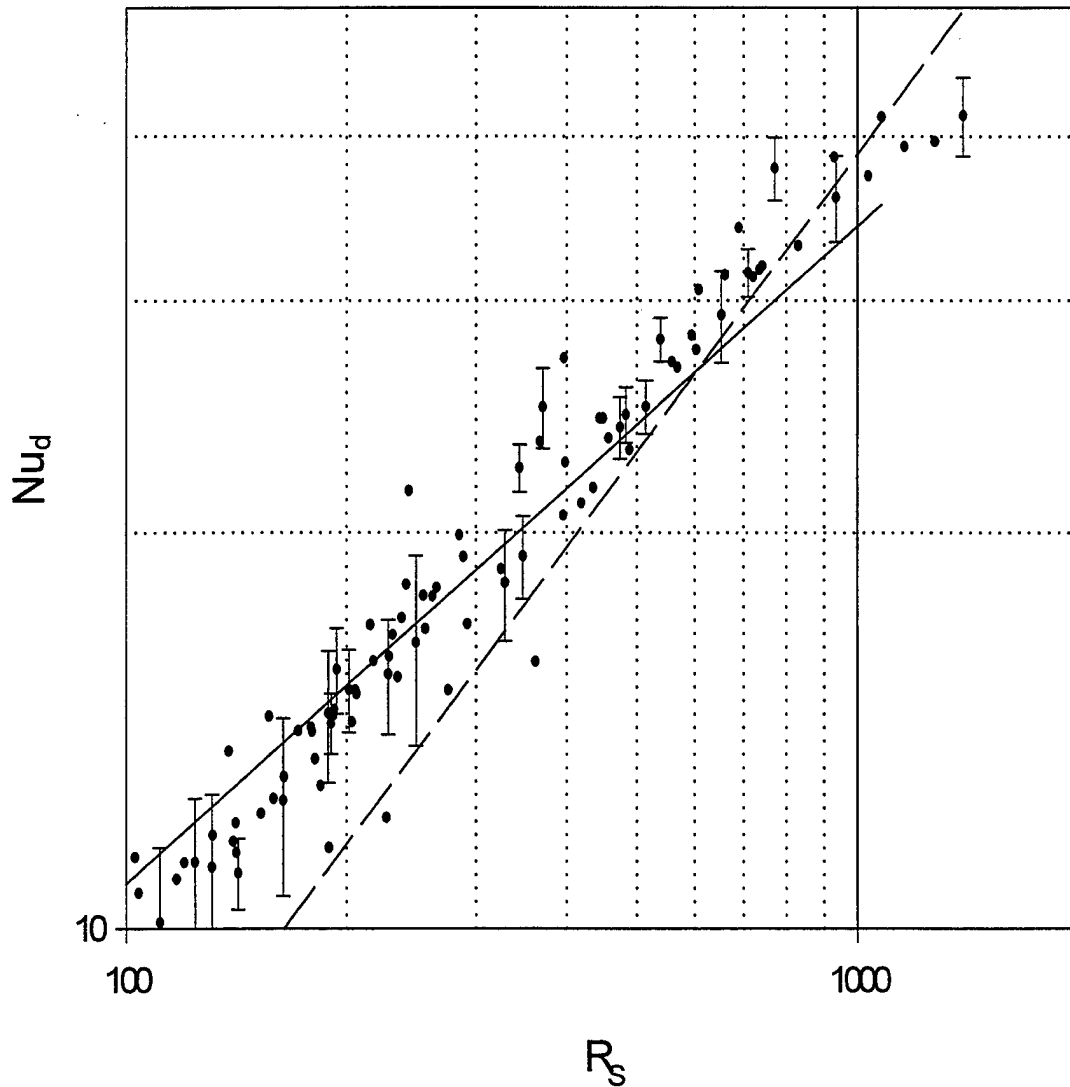


Figure 11: Nusselt Number vs. Streaming Reynolds Number for $S_T/d=1.5$.

The solid line is a $R_s^{0.5}$ fit through the data. The dashed line is a $R_s^{0.75}$ fit in the vortex shedding regime. Error bars are included for arbitrary data points.

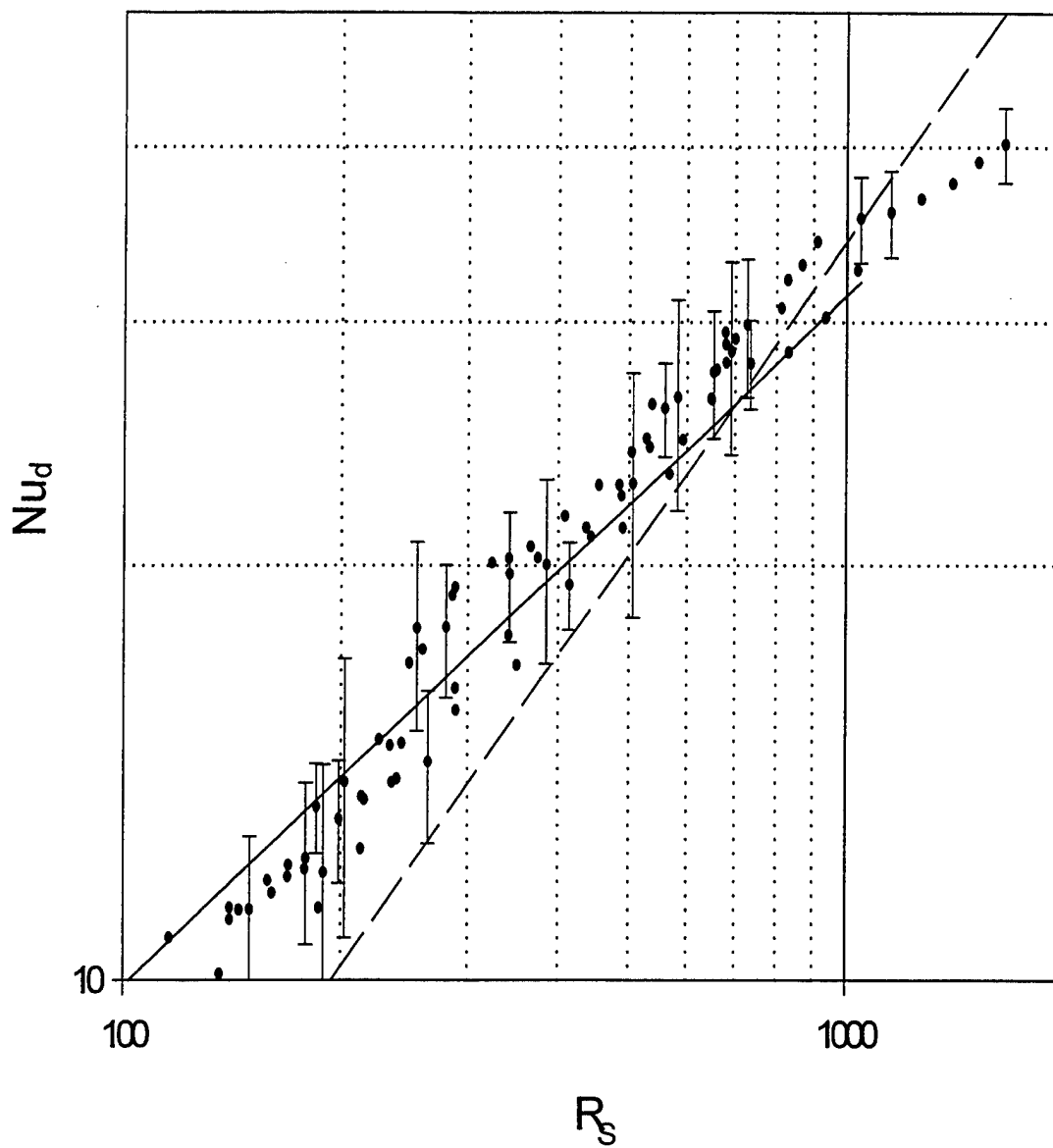


Figure 12: Nusselt Number vs. Streaming Reynolds Number for $S_T/d=1.75$.

The solid line is a $R_s^{0.5}$ fit through the data. The dashed line is a $R_s^{0.75}$ fit in the vortex shedding regime. Error bars are included for arbitrary data points.

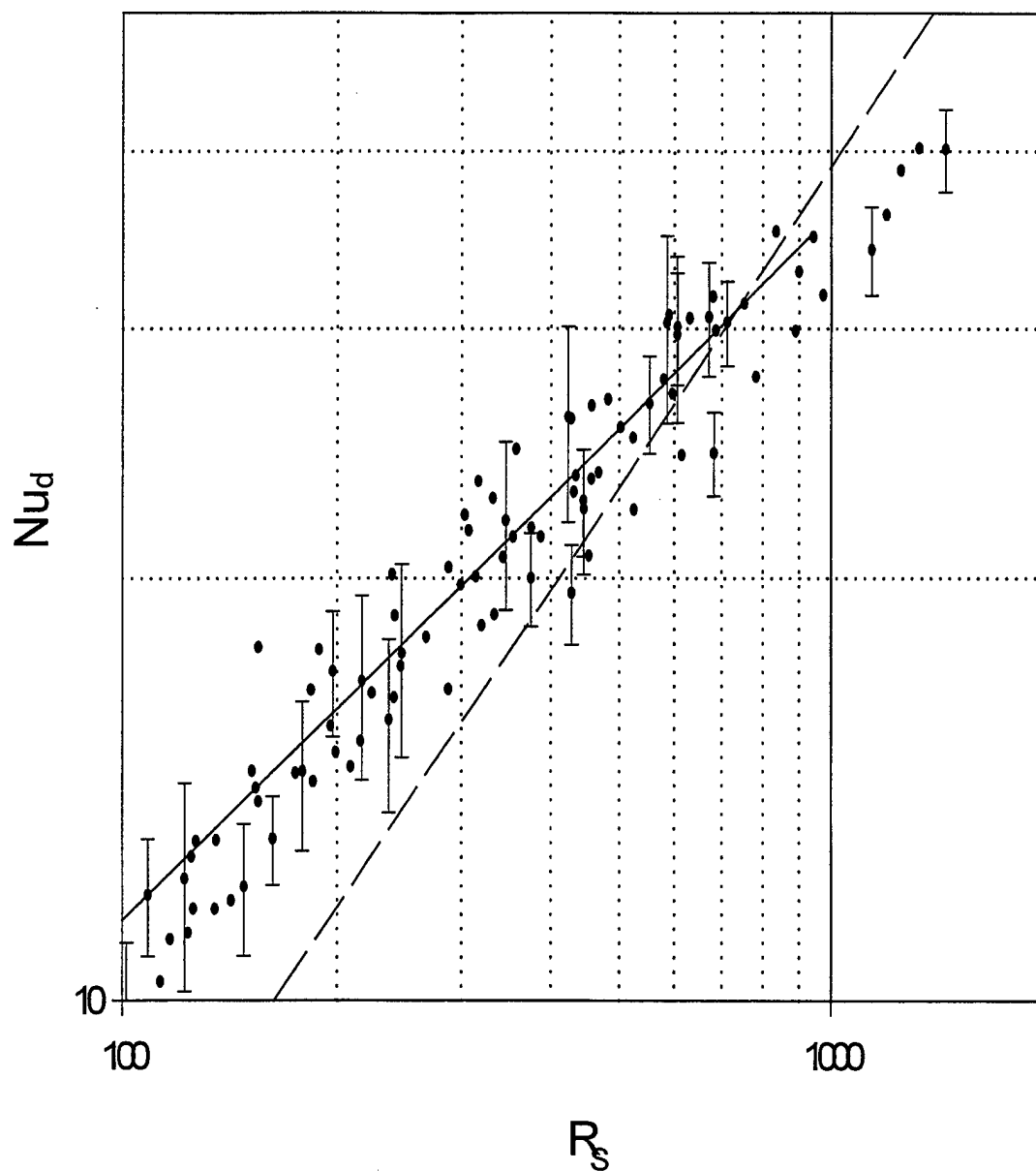


Figure 13: Nusselt Number vs. Streaming Reynolds Number for $S_T/d=2.0$.

The solid line is a $R_s^{0.5}$ fit through the data. The dashed line is a $R_s^{0.75}$ fit in the vortex shedding regime. Error bars are included for arbitrary data points.

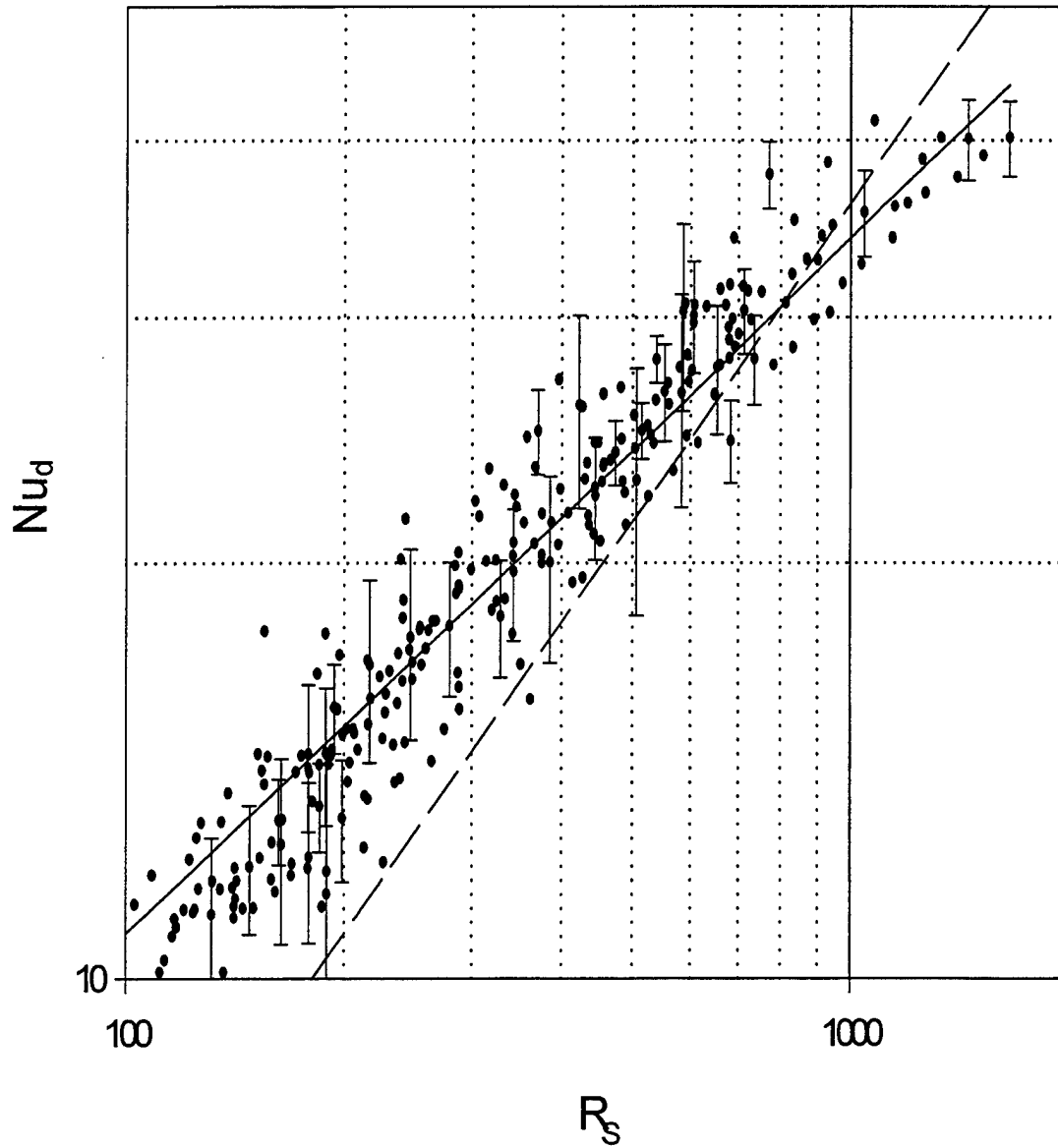


Figure 14: Nusselt Number vs. Streaming Reynolds Number for all $\phi > 1$.

The solid line is a $R_s^{0.5}$ fit through the data. The dashed line is a $R_s^{0.75}$ fit in the vortex shedding regime. Error bars are included for arbitrary data points.

Figures 11-14 indicate that the data from individual frequencies cannot be distinguished from one other. With $\phi > 1$, the data falls along roughly the same curve. Nu_d is independent of the tube spacing, and ϕ is not necessary to correlate the data.

Figure 15 is a logarithmic plot of Nu_d vs. R_s for $S_T/d=1.25$. For this close spacing, $\phi < 1$ for all frequencies used, and boundary layer interference becomes an issue. From Figure 15 it is obvious that the data for the different frequencies do not fall on the same curve. Nu_d can not be correlated with R_s alone, and the influence of ϕ must also be included. This data was correlated using the form

$$Nu_d = C \phi^a R_s^b \quad (25)$$

Again, there was a transition at $R_s=500$, so the correlations used $b=0.5$ for $R_s < 500$, and $b=0.75$ for $R_s > 500$. The following results were found

$$Nu_d = 1.07 \phi^{0.19} R_s^{0.5} \quad R_s < 500, \phi < 1 \quad (26-a)$$

$$Nu_d = 0.21 \phi^{0.11} R_s^{0.75} \quad R_s > 500, \phi < 1 \quad (26-b)$$

Eqns. (26-a) and (26-b) show that as $\phi \rightarrow 1$, the correlations converge to those of an isolated cylinder.

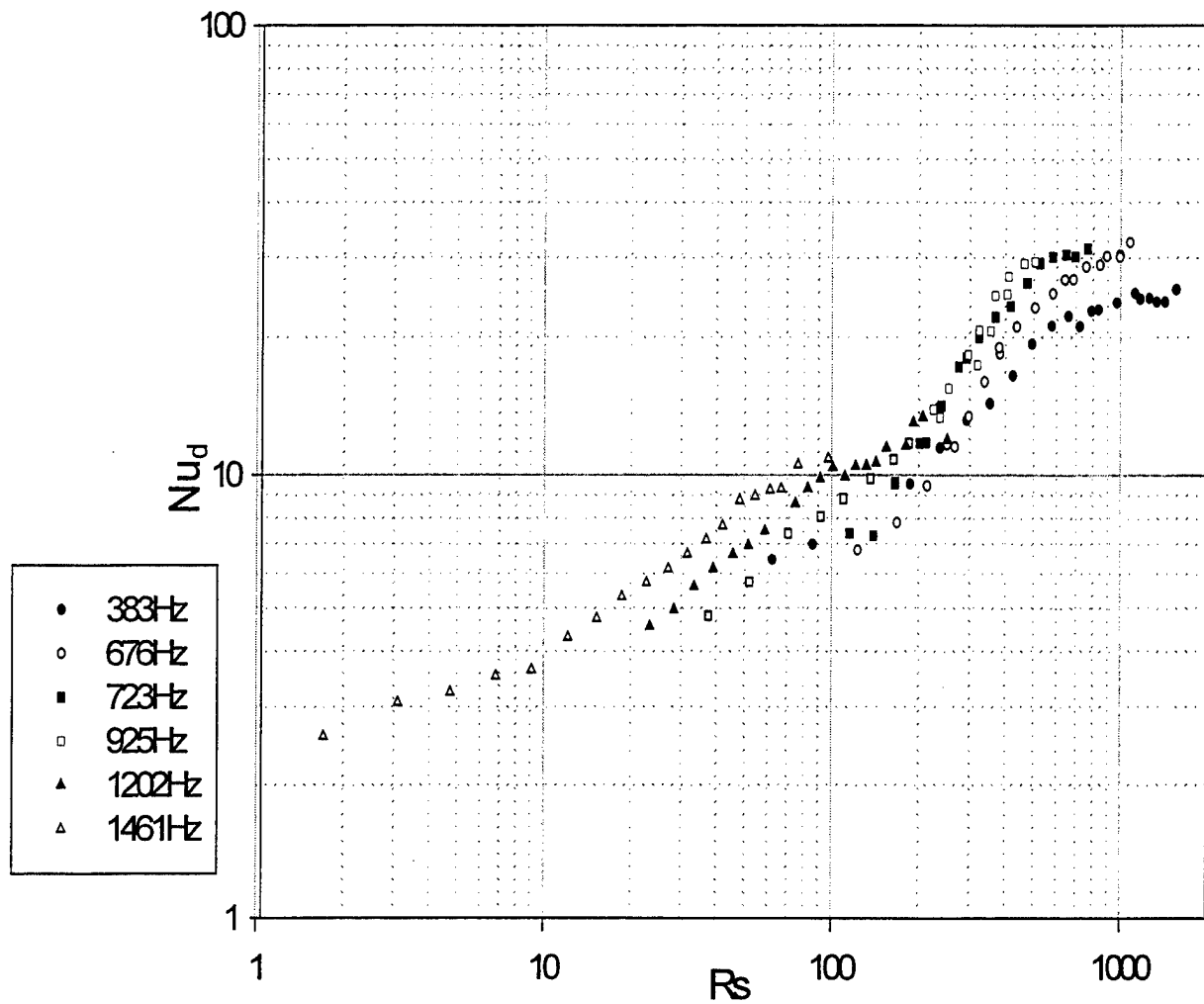


Figure 15: Nusselt Number vs. Streaming Reynolds Number for $ST/d=1.25$.

The interference parameter ϕ is <1 for all frequencies.

V. CONCLUSIONS AND RECOMMENDATIONS

Experiments were performed to determine the effect of tube spacing on convective heat transfer from a tube bank in a zero mean oscillating flow. A tube bank is used to model a heat exchanger. The role of the interference of boundary layers on adjacent tubes in the tube bank was discussed. The effect of boundary layer interference is needed to design more efficient heat exchangers for thermoacoustic engines.

Without boundary layer interference, the heat transfer from a tube bank closely follows that of an isolated cylinder. It was found that, as expected, the Nusselt number does not depend on tube pitch for sufficiently large spacings corresponding to values of ϕ greater than 1. However for values of ϕ less than 1, the Nusselt number must be correlated to ϕ as well as Re_s . As the tube spacing and hence ϕ decreases, the heat transfer rate characterized by Nu_d is degraded. However, the decrease in Nu_d is not great, especially at high values of Re_s . At high streaming Reynolds numbers, ϕ can be as low as 0.12 although Nu_d is still at 80% of its value for $\phi=1$. At low streaming Reynolds numbers, ϕ can be as low as 0.32 and still have less than 20% degradation in Nu_d . It can be concluded that only a small sacrifice in heat transfer will result from having closely spaced tubes. Provided that ϕ is not too small, heat exchanger designs can use a cluster of many closely spaced tubes, allowing more cooling fluid to be transported, without significantly degrading the heat transfer characteristics of each tube.

Based on a random error propagation analysis, it was determined that the greatest source of uncertainty came from temperature measurements. Future experiments would benefit from more precise measurements of temperature. Additionally, the way in which the ambient temperature is measured could be improved. Instead of inserting a

thermocouple probe into the sound chamber after the data run, a thermocouple permanently fixed to the inside surface of the sound chamber, in such a way as to not interfere with the flow characteristics, would allow the ambient temperature and cylinder temperature to be recorded simultaneously.

To carry this study further, it is recommended that a similar experiment be conducted to determine the affect of an in-line arrangement of cylinders, that is, a bank of cylinders arranged with their plane parallel to the direction of fluid oscillation. Such an experiment could study both aligned and staggered cylinders as in conventional heat exchanger tube bank arrangements. Additionally, determining the heat transfer characteristics of finned cylinders would greatly benefit heat exchanger design. Finally, experiments with fluids other than air would allow a Prandtl number dependence to be studied.

APPENDIX

A. SAMPLE CALCULATIONS

The following sample calculations use the following data:

Measured Values:

$$\begin{aligned}S_T/d &= 1.25 \\L &= .65 \text{ m} \\f &= 676 \text{ Hz} \\V_{mic} &= 1878 \text{ mV} \\V_R &= 0.17225 \text{ V} \\V_H &= 10.2805 \text{ V} \\T_H &= 28.6^\circ\text{C} \\T_A &= 22.9^\circ\text{C}\end{aligned}$$

Constants:

$$\begin{aligned}R_{air} &= 287 \text{ m}^2/\text{s}^2\text{K} \\\gamma &= 1.4 \\P_m &= 14.7 \text{ psi} \\L_H &= .076 \text{ m} \\S &= 50.89 \text{ mV/psi} \\G &= 100 \\d &= .003175 \text{ m}\end{aligned}$$

1. Nusselt Number

The average fluid temperature is:

$$T_{avg} = \frac{T_H + T_A}{2} = \frac{28.6^\circ\text{C} + 22.9^\circ\text{C}}{2} = 25.75^\circ\text{C} = 298.9\text{K} \quad (\text{A-1})$$

From this, the following values are taken from Kays (XXX):

$$k_{air} = .0260646 \text{ W/mK}$$

$$\nu = .00001563 \text{ m}^2/\text{s}$$

ΔT is calculated as follows:

$$\Delta T = T_H - T_A = 28.6^\circ C - 22.9^\circ C = 5.7^\circ C = 5.7 K \quad (A-2)$$

The Nusselt number is then calculated:

$$Nu_d = \frac{V_R V_H}{\pi R_R L_H (\Delta T) k_{air}} = \frac{(0.17225V)(10.2805V)}{\pi (2\Omega)(.076m)(5.7K)(.0260646 \frac{W}{mK})} = 24.96 \quad (A-3)$$

2. Streaming Reynolds Number

The speed of sound is given by:

$$c = \sqrt{\gamma R_{air} T_{avg}} = \sqrt{(1.4)(287 \frac{m^2}{s^2 K})(298.9K)} = 346.55 \frac{m}{s} \quad (A-4)$$

The pressure ratio is given by:

$$\frac{P_o}{P_m} = \frac{V_{mic}/SG}{P_m} = \frac{1878mV / (50.89mV/psi)(100)}{14.7psi} = .0251 \quad (A-5)$$

The angular frequency is:

$$\omega = 2\pi f = (2\pi \frac{rad}{cycle})(676Hz) = 4247.433 \frac{rad}{s} \quad (A-6)$$

The streaming Reynolds number is then:

$$R_s = \frac{c^2}{\omega \nu \gamma^2} \left(\frac{P_o}{P_m} \right)^2 = \frac{(346.55 \frac{m}{s})^2}{(4247.433 \frac{rad}{s})(.00001563 \frac{m^2}{s})(1.4)^2} (.0251)^2 = 581.5 \quad (A-7)$$

B. UNCERTAINTY ANALYSIS

This uncertainty analysis is done using uncertainty propagation found in Beckwith et al. (1993).

1. Nusselt Number

The Nusselt number equation is:

$$Nu_d = \frac{hd}{k_{air}} = \frac{V_H V_R}{\pi L_H R_R \Delta T k_{air}} \quad (A-8)$$

The fractional uncertainty of the Nusselt number is:

$$\frac{u_{Nu_d}}{Nu_d} = \sqrt{\left(\frac{u_{\Delta T}}{\Delta T}\right)^2 + \left(\frac{u_{V_R}}{V_R}\right)^2 + \left(\frac{u_{V_H}}{V_H}\right)^2 + \left(\frac{u_{R_R}}{R_R}\right)^2 + \left(\frac{u_{L_H}}{L_H}\right)^2 + \left(\frac{u_{k_{air}}}{k_{air}}\right)^2} \quad (A-9)$$

The uncertainties of the temperature measurements are 0.5°C. With $\Delta T = T_H - T_A$, the uncertainty of the temperature difference is:

$$u_{\Delta T} = \sqrt{\left(\frac{\partial \Delta T}{\partial T_H} u_{T_H}\right)^2 + \left(\frac{\partial \Delta T}{\partial T_A} u_{T_A}\right)^2} = \sqrt{[(1)(0.5^\circ C)]^2 + [(1)(0.5^\circ C)]^2} = .7071^\circ C = .7071 K \quad (A-10)$$

The uncertainties in the voltage measurements are taken from the HP multimeter's users manual:

$$u_{VR} = u_{VH} = 0.05\% \text{reading} + 0.02\% \text{full scale output}$$

The resistance uncertainty is 1% of the resistor value. The uncertainty of the heater length is 0.001". The uncertainty of k_{air} is 0.00005 W/mK.

2. Streaming Reynolds Number

The streaming Reynolds number is:

$$R_s = \left(\frac{R_{air}}{2\pi\gamma P_m^2} \right) \frac{T_{avg} V_{mic}^2}{f \nu G^2 S^2} \quad (A-11)$$

The fractional uncertainty is then:

$$\frac{u_{R_s}}{R_s} = \sqrt{\left(\frac{u_{T_{avg}}}{T_{avg}} \right)^2 + \left(\frac{u_f}{f} \right)^2 + \left(\frac{u_\nu}{\nu} \right)^2 + \left(2 \frac{u_{V_{mic}}}{V_{mic}} \right)^2 + \left(2 \frac{u_G}{G} \right)^2 + \left(2 \frac{u_S}{S} \right)^2} \quad (A-12)$$

With $T_{avg} = (T_H + T_A)/2$, the uncertainty in T_{avg} is:

$$u_{T_{avg}} = \sqrt{\left(\frac{\partial T_{avg}}{\partial T_H} u_{T_H} \right)^2 + \left(\frac{\partial T_{avg}}{\partial T_A} u_{T_A} \right)^2} = \sqrt{\left(\frac{0.5^\circ C}{2} \right)^2 + \left(\frac{0.5^\circ C}{2} \right)^2} = 0.3536^\circ C = 0.3536 K \quad (A-13)$$

The uncertainty in the frequency is taken from the HP waveform generator user's manual:

$$u_f = 20 \times 10^{-6} \times \text{reading}$$

The uncertainty in ν is $5 \times 10^{-10} \text{ m}^2/\text{s}$. The uncertainty in V_{mic} is 5mV. The uncertainty in G is 0.4. The uncertainty in S due to nonlinearity is given by the pressure transducer calibration data as 0.381mV/psi.

C. EXPERIMENTAL DATA

The following pages contain the data gathered through experimentation in computer spreadsheet form. All important parameters are listed, although some constants have been omitted to reduce size.

Svd	1.25	L (m)																	0.24000
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC (C)	deltaT (C)	Tavg (C)	kW/mK	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	N ²	Rs	phi	
1	383	544	0.08368	4.99560	28	23.2	4.8	25.6	0.026054	6.9988	346.465	1.56E-05	0.00727	0.23554	0.022	1554	86.189	0.243	
2	383	463	0.08195	4.89270	28.2	23.2	5	25.7	0.026061	6.444	346.523	1.56E-05	0.00619	0.2005	0.022	1553	62.417	0.243	
3	383	1577	0.18517	11.65210	32.2	23.6	8.6	27.9	0.026222	21.119	347.786	1.58E-05	0.02108	0.68542	0.022	1533	720.04	0.239	
4	383	1651	0.20544	12.26480	32.3	23.5	8.8	27.9	0.026222	22.867	347.796	1.58E-05	0.02207	0.71758	0.022	1533	789.2	0.239	
5	383	1700	0.22101	13.19470	33.7	23.6	10.1	28.65	0.026276	23.011	348.229	1.59E-05	0.02272	0.7398	0.022	1526	835.14	0.238	
6	383	1971	0.23521	14.04250	34.2	23.7	10.5	28.95	0.026298	26.049	348.402	1.59E-05	0.02635	0.85816	0.022	1523	1121.8	0.238	
7	383	1833	0.23922	14.28190	35.1	23.7	11.4	29.4	0.026331	23.836	348.661	1.6E-05	0.0245	0.79867	0.022	1519	989.09	0.237	
8	383	2090	0.24621	14.69890	35.5	23.7	11.8	29.6	0.026345	24.378	348.776	1.6E-05	0.02794	0.91095	0.022	1517	1269.2	0.237	
9	383	2154	0.25628	15.30020	36.7	23.7	13	30.2	0.026389	23.936	349.122	1.6E-05	0.02879	0.93977	0.022	1512	1335.5	0.236	
10	383	2229	0.25628	15.30020	36.8	23.8	13	30.3	0.026396	23.928	349.179	1.61E-05	0.0298	0.97265	0.022	1511	1429.8	0.236	
11	383	2010	0.22268	13.29430	33.3	23.6	9.7	28.45	0.026262	24.336	348.113	1.59E-05	0.02687	0.87441	0.022	1528	1168.1	0.239	
12	383	2325	0.21700	12.95520	32.4	23.6	8.8	28	0.026229	26.606	347.854	1.58E-05	0.03108	1.01069	0.022	1532	1664.7	0.239	
13	383	1507	0.20163	12.03750	32.2	23.5	8.7	27.85	0.026218	22.283	347.767	1.58E-05	0.02014	0.65494	0.022	1533	657.62	0.24	
14	383	1410	0.18722	11.17750	31.5	23.6	7.9	27.55	0.026196	21.176	347.594	1.58E-05	0.01885	0.61248	0.022	1536	678.13	0.24	
15	383	1304	0.17412	10.39550	30.9	23.4	7.5	27.15	0.026167	19.315	347.362	1.58E-05	0.01743	0.56606	0.022	1539	493.26	0.241	
16	383	1209	0.15069	8.99620	30	23.4	6.6	26.7	0.026134	16.458	347.102	1.57E-05	0.01616	0.52442	0.022	1544	424.5	0.241	
17	383	1103	0.13720	8.19090	29.6	23.3	6.3	26.45	0.026116	14.303	346.957	1.57E-05	0.01474	0.47825	0.022	1546	353.55	0.242	
18	383	1003	0.12944	7.72780	29.5	23.4	6.1	26.45	0.026116	13.149	346.957	1.57E-05	0.01341	0.43489	0.022	1546	282.35	0.242	
19	383	901	0.10931	6.52570	28.4	23.4	5	25.9	0.026076	11.457	346.639	1.56E-05	0.01204	0.3903	0.022	1551	238.25	0.242	
20	383	799	0.09563	5.70920	27.9	23.3	4.6	25.6	0.026054	9.5389	346.465	1.56E-05	0.01068	0.34594	0.022	1554	186.93	0.243	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC (C)	deltaT (C)	Tavg (C)	kW/mK	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	N ²	Rs	phi	

UdIT	UVRVR	UVH/VH	Uk/k	UNu/Nu	UNu
0.1473	0.0003	0.0001	0.0004	0.14765	1.03354
0.1414	0.0003	0.0001	0.0004	0.14177	0.9136
0.0822	0.0002	0.0001	0.0004	0.08283	1.74925
0.0804	0.0002	0.0001	0.0004	0.08097	1.8516
0.07	0.0002	0.0001	0.0004	0.07072	1.6274
0.0673	0.0002	0.0001	0.0004	0.06808	1.70545
0.062	0.0002	0.0001	0.0004	0.06283	1.49757
0.0599	0.0002	0.0001	0.0004	0.06076	1.4811
0.0544	0.0002	0.0001	0.0004	0.05531	1.32381
0.0544	0.0002	0.0001	0.0004	0.05531	1.32345
0.0729	0.0002	0.0001	0.0004	0.07358	1.79072
0.0804	0.0002	0.0001	0.0004	0.08097	2.06535
0.0813	0.0002	0.0001	0.0004	0.08189	1.82478
0.0895	0.0002	0.0001	0.0004	0.09007	1.90723
0.0943	0.0002	0.0001	0.0004	0.09481	1.83128
0.1071	0.0002	0.0001	0.0004	0.1076	1.77099
0.1122	0.0003	0.0001	0.0004	0.11268	1.61177
0.1159	0.0003	0.0001	0.0004	0.11635	1.52991
0.1414	0.0003	0.0001	0.0004	0.14177	1.62431
0.1537	0.0003	0.0001	0.0004	0.15404	1.46956
UdIT	UVRVR	UVH/VH	Uk/k	UNu/Nu	UNu

UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0276211	0.00002	3E-05	0.0091912	0.0034	0.0075	0.03703	3.19164
0.0275136	0.00002	3E-05	0.0107991	0.0034	0.0075	0.03865	2.4125
0.0253441	0.00002	3E-05	0.0031706	0.0034	0.0075	0.03087	22.2279
0.0253441	0.00002	3E-05	0.0030285	0.0034	0.0075	0.03081	24.3178
0.0248806	0.00002	3E-05	0.0029412	0.0034	0.0075	0.03024	25.251
0.0244249	0.00002	3E-05	0.0025368	0.0034	0.0075	0.02988	33.5177
0.024051	0.00002	3E-05	0.0027278	0.0034	0.0075	0.02964	28.7258
0.0238885	0.00002	3E-05	0.0023923	0.0034	0.0075	0.02939	37.0141
0.0234139	0.00002	3E-05	0.0023213	0.0034	0.0075	0.02899	38.7119
0.0233366	0.00002	3E-05	0.0022432	0.0034	0.0075	0.0289	41.3197
0.0248541	0.00002	3E-05	0.0024876	0.0034	0.0075	0.03021	35.2935
0.0252536	0.00002	3E-05	0.0021505	0.0034	0.0075	0.03044	47.6316
0.0253896	0.00002	3E-05	0.0033179	0.0034	0.0075	0.03097	20.3661
0.0256661	0.00002	3E-05	0.0035461	0.0034	0.0075	0.0313	18.031
0.0260442	0.00002	3E-05	0.0038344	0.0034	0.0075	0.03174	15.6572
0.0264831	0.00002	3E-05	0.0041356	0.0034	0.0075	0.03225	13.6911
0.0267335	0.00002	3E-05	0.0045331	0.0034	0.0075	0.03267	11.5505
0.0267335	0.00002	3E-05	0.004985	0.0034	0.0075	0.03293	9.62777
0.0273012	0.00002	3E-05	0.0055484	0.0034	0.0075	0.03375	7.97307
0.0276211	0.00002	3E-05	0.0062578	0.0034	0.0075	0.0345	6.4139
UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

SUD	1.25	L (m)																	0.65
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC)	deltaT(C)	Tavg (C)	k(V/mK)	Nu	c (m/s)	v (m²/2s)	PR	epsilon	X	V²	Rs	phi	
1	676	864	0.09376		5.59603	29.5	23.3	6.2	26.4	0.026112	6.787	346.928	1.57E-05	0.01155	0.21223	0.039	2729	122.92	0.426
2	676	1011	0.10938		6.52809	30.6	23.3	7.3	26.95	0.026152	7.8323	347.247	1.57E-05	0.01351	0.24857	0.039	2720	168.07	0.425
3	676	1139	0.12504		7.46296	31.2	23.3	7.9	27.25	0.026174	9.4509	347.42	1.58E-05	0.01523	0.28018	0.039	2716	213.16	0.424
4	676	1272	0.14071		8.39822	31.5	23.3	8.2	27.4	0.026185	11.526	347.507	1.58E-05	0.017	0.31297	0.039	2713	266.76	0.424
5	676	1235	0.15640		9.33432	33.3	23.3	10	28.3	0.026251	11.646	348.027	1.59E-05	0.01651	0.30432	0.039	2699	249.94	0.422
6	676	1348	0.17201		10.26621	33.7	23.2	10.5	28.45	0.026262	13.411	348.113	1.59E-05	0.01802	0.33225	0.039	2696	297.66	0.421
7	676	1438	0.18772		11.20410	33.8	23.3	10.5	28.55	0.026269	16.989	348.171	1.59E-05	0.01922	0.35449	0.039	2695	338.64	0.421
8	676	1529	0.20333		12.13567	34.1	23.4	10.7	28.75	0.026284	18.374	348.286	1.59E-05	0.02044	0.37705	0.039	2692	382.67	0.421
9	676	2456	0.20333		12.13567	29.6	23.1	6.5	26.35	0.026108	30.46	346.899	1.57E-05	0.03283	0.60323	0.039	2730	983.4	0.427
10	676	2556	0.21652		12.92270	30	23.1	6.9	26.55	0.026123	32.608	347.015	1.57E-05	0.03417	0.628	0.039	2727	1075.4	0.426
11	676	1519	0.14879		8.88025	28.5	22.9	5.6	25.7	0.026061	18.959	346.523	1.56E-05	0.02031	0.37268	0.039	2740	380.63	0.428
12	676	1629	0.15682		9.35933	28.5	22.9	5.6	25.7	0.026061	21.06	346.523	1.56E-05	0.02178	0.39967	0.039	2740	437.76	0.428
13	676	1749	0.16463		9.82595	28.5	22.9	5.6	25.7	0.026061	23.212	346.523	1.56E-05	0.02338	0.42911	0.039	2740	504.63	0.428
14	676	1878	0.17225		10.28055	28.6	22.9	5.7	25.75	0.026065	24.961	346.552	1.56E-05	0.0251	0.4608	0.039	2740	581.74	0.428
15	676	1968	0.18007		10.74730	28.7	22.9	5.8	25.8	0.026068	26.805	346.581	1.56E-05	0.02631	0.48293	0.039	2739	638.76	0.428
16	676	2036	0.18790		11.21430	29.2	22.9	6.3	26.05	0.026087	26.865	346.725	1.57E-05	0.02722	0.49982	0.039	2735	683.22	0.427
17	676	2141	0.19573		11.68170	29.2	22.8	6.4	26	0.026083	28.683	346.697	1.57E-05	0.02862	0.52555	0.039	2736	755.6	0.427
18	676	2326	0.20415		12.18420	29.4	22.8	6.6	26.1	0.02609	30.26	346.754	1.57E-05	0.03109	0.57106	0.039	2734	891.69	0.427
19	676	2265	0.20415		12.18420	29.7	22.8	6.9	26.25	0.026101	28.922	346.841	1.57E-05	0.03028	0.55623	0.039	2732	846.11	0.427
20	676	2454	0.21136		12.61460	29.9	22.8	7.1	26.35	0.026108	30.12	346.899	1.57E-05	0.0328	0.60274	0.039	2730	991.78	0.427
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC)	deltaT(C)	Tavg (C)	k(V/mK)	Nu	c (m/s)	v (m²/2s)	PR	epsilon	X	V²	Rs	phi	

Ud/T	UVRVR	UVHVR	Ukk	UNu/Nu	UNu
0.114	0.0003	0.0001	0.0004	0.11449	0.77702
0.0969	0.0003	0.0001	0.0004	0.09738	0.76271
0.0895	0.0003	0.0001	0.0004	0.09007	0.8512
0.0862	0.0003	0.0001	0.0004	0.08681	1.00054
0.0707	0.0002	0.0001	0.0004	0.07142	0.8317
0.0673	0.0002	0.0001	0.0004	0.06808	0.91307
0.0673	0.0002	0.0001	0.0004	0.06808	1.08721
0.0661	0.0002	0.0001	0.0004	0.06684	1.22812
0.1088	0.0002	0.0001	0.0004	0.10924	3.32647
0.1025	0.0002	0.0001	0.0004	0.10297	3.34719
0.1263	0.0003	0.0001	0.0004	0.12666	2.40147
0.1263	0.0002	0.0001	0.0004	0.12666	2.66757
0.1263	0.0002	0.0001	0.0004	0.12666	2.9402
0.1241	0.0002	0.0001	0.0004	0.12446	3.10652
0.1219	0.0002	0.0001	0.0004	0.12232	3.27886
0.1122	0.0002	0.0001	0.0004	0.11268	3.02552
0.1105	0.0002	0.0001	0.0004	0.11094	3.18204
0.1071	0.0002	0.0001	0.0004	0.1076	3.26499
0.1025	0.0002	0.0001	0.0004	0.10297	2.97805
0.0996	0.0002	0.0001	0.0004	0.10009	3.01485
Ud/T	UVRVR	UVHVR	Ukk	UNu/Nu	UNu

UTavg/Tavg	Uif	Uvv	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0267841	0.00002	3E-05	0.005787	0.0034	0.0075	0.03349	4.11714
0.0262375	0.00002	3E-05	0.0049456	0.0034	0.0075	0.03251	5.46355
0.0259486	0.00002	3E-05	0.0043898	0.0034	0.0075	0.03195	6.81077
0.0258066	0.00002	3E-05	0.0039308	0.0034	0.0075	0.03159	8.39632
0.0249859	0.00002	3E-05	0.0040486	0.0034	0.0075	0.03099	7.74534
0.0248541	0.00002	3E-05	0.0037092	0.0034	0.0075	0.03071	9.14155
0.0247671	0.00002	3E-05	0.0034771	0.0034	0.0075	0.03053	10.3396
0.0245948	0.00002	3E-05	0.0032701	0.0034	0.0075	0.0303	11.595
0.0268349	0.00002	3E-05	0.0020358	0.0034	0.0075	0.03174	31.526
0.0266328	0.00002	3E-05	0.0019562	0.0034	0.0075	0.03154	33.9227
0.0275136	0.00002	3E-05	0.0032916	0.0034	0.0075	0.03272	12.4555
0.0275136	0.00002	3E-05	0.0030694	0.0034	0.0075	0.03264	14.2868
0.0275136	0.00002	3E-05	0.0028588	0.0034	0.0075	0.03256	16.4306
0.0274602	0.00002	3E-05	0.0026624	0.0034	0.0075	0.03245	18.8762
0.027407	0.00002	3E-05	0.0025407	0.0034	0.0075	0.03236	20.6723
0.027144	0.00002	3E-05	0.0024558	0.0034	0.0075	0.03211	21.9414
0.0271962	0.00002	3E-05	0.0023354	0.0034	0.0075	0.03212	24.2722
0.027092	0.00002	3E-05	0.0021496	0.0034	0.0075	0.03198	28.5156
0.0269371	0.00002	3E-05	0.0022075	0.0034	0.0075	0.03187	26.9318
0.0268349	0.00002	3E-05	0.0020375	0.0034	0.0075	0.03174	31.4751
UTavg/Tavg	Uif	Uvv	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Std		L (m)																
1.25		0.60000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	n ²	Rs	phi
1	723	865	0.09387	5.60247	28.6	22.9	5.7	25.75	0.026065	7.4128	346.552	1.56E-05	0.01156	0.19845	0.042	2930	116.39	0.458
2	723	1037	0.10972	6.54870	28.9	22.9	6	25.9	0.026076	9.6178	346.639	1.56E-05	0.01386	0.23797	0.042	2928	166.78	0.457
3	723	1142	0.12526	7.47588	29.4	23	6.4	26.2	0.026098	11.741	346.812	1.57E-05	0.01527	0.26219	0.042	2922	200.9	0.457
4	723	1244	0.14070	8.39748	29.6	22.9	6.7	26.25	0.026101	14.149	346.841	1.57E-05	0.01663	0.28564	0.042	2921	238.36	0.456
5	723	1334	0.15638	9.33320	29.6	22.8	6.8	26.2	0.026098	17.223	346.812	1.57E-05	0.01783	0.30627	0.042	2922	274.13	0.457
6	723	1449	0.17206	10.26894	29.7	22.6	7.1	26.15	0.026094	19.971	346.783	1.57E-05	0.01937	0.33265	0.042	2923	323.47	0.457
7	723	1548	0.18770	11.20239	30.2	22.6	7.6	26.4	0.026112	22.188	346.928	1.57E-05	0.02069	0.35553	0.042	2919	368.95	0.456
8	723	1645	0.20395	12.17259	31	22.5	8.5	26.75	0.026138	23.401	347.131	1.57E-05	0.02199	0.37802	0.042	2913	416.26	0.455
9	723	1757	0.21899	13.06987	31.3	22.6	8.7	26.95	0.026152	26.343	347.247	1.57E-05	0.02349	0.4039	0.042	2909	474.63	0.455
10	723	1848	0.23445	13.99278	31.6	22.6	9	27.1	0.026163	29.176	347.333	1.58E-05	0.0247	0.42492	0.042	2907	524.86	0.454
11	723	1943	0.23445	13.99278	31.3	22.6	8.7	26.95	0.026152	30.195	347.247	1.57E-05	0.02597	0.44665	0.042	2909	580.43	0.455
12	723	2049	0.23445	13.99278	31.2	22.6	8.6	26.9	0.026149	30.55	347.218	1.57E-05	0.02739	0.47098	0.042	2910	645.68	0.455
13	723	2123	0.23857	14.23870	31.4	22.4	9	26.9	0.026149	30.227	347.218	1.57E-05	0.02838	0.48799	0.042	2910	693.05	0.455
14	723	950	0.08642	5.15758	27.3	22.4	4.9	24.85	0.025899	7.3264	346.029	1.55E-05	0.0127	0.21762	0.042	2946	139.51	0.46
15	723	1034	0.10165	6.06709	27.6	22.4	5.2	25	0.02601	9.5493	346.117	1.56E-05	0.01382	0.23692	0.042	2943	165.21	0.46
16	723	1170	0.11709	6.98853	28	22.4	5.6	25.2	0.026024	11.769	346.233	1.56E-05	0.01564	0.26817	0.042	2940	211.41	0.459
17	723	2231	0.24909	14.86632	31.8	22.4	9.4	27.1	0.026163	31.531	347.333	1.58E-05	0.02982	0.51299	0.042	2907	764.96	0.454
18	723	1234	0.13337	7.95984	28.5	22.4	6.1	25.45	0.026043	13.984	346.378	1.56E-05	0.0165	0.28296	0.042	2935	235.02	0.459
19	723	1377	0.14881	8.88133	28.3	22.4	5.9	25.35	0.026035	18.017	346.32	1.56E-05	0.01841	0.3157	0.042	2937	292.73	0.459
20	723	1448	0.16485	9.83909	28.8	22.4	6.4	25.6	0.026054	20.371	346.465	1.56E-05	0.01936	0.33211	0.042	2933	323.48	0.458
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	n ²	Rs	phi

Ud/T	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu
0.1241	0.0003	0.0001	0.0004	0.12446	0.92257
0.1179	0.0003	0.0001	0.0004	0.11827	1.13754
0.1105	0.0003	0.0001	0.0004	0.11094	1.30249
0.1055	0.0003	0.0001	0.0004	0.10601	1.49992
0.104	0.0002	0.0001	0.0004	0.10447	1.79921
0.0996	0.0002	0.0001	0.0004	0.10009	1.999
0.093	0.0002	0.0001	0.0004	0.09358	2.07628
0.0832	0.0002	0.0001	0.0004	0.08379	1.96073
0.0813	0.0002	0.0001	0.0004	0.08189	2.15724
0.0786	0.0002	0.0001	0.0004	0.0792	2.31081
0.0813	0.0002	0.0001	0.0004	0.08189	2.47266
0.0822	0.0002	0.0001	0.0004	0.08283	2.53042
0.0786	0.0002	0.0001	0.0004	0.0792	2.39408
0.1443	0.0003	0.0001	0.0004	0.14465	1.05979
0.136	0.0003	0.0001	0.0004	0.13635	1.30204
0.1263	0.0003	0.0001	0.0004	0.12666	1.48939
0.0752	0.0002	0.0001	0.0004	0.07599	2.39281
0.1159	0.0003	0.0001	0.0004	0.11635	1.62821
0.1198	0.0003	0.0001	0.0004	0.12027	2.16686
0.1105	0.0002	0.0001	0.0004	0.11094	2.25991
Ud/T	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0274602	0.00002	3E-05	0.0057803	0.0034	0.0075	0.03403	3.92701
0.0273012	0.00002	3E-05	0.0048216	0.0034	0.0075	0.0333	5.52027
0.0269885	0.00002	3E-05	0.0043783	0.0034	0.0075	0.03279	6.58842
0.0269371	0.00002	3E-05	0.0040193	0.0034	0.0075	0.03257	7.76281
0.0269885	0.00002	3E-05	0.0037481	0.0034	0.0075	0.03248	8.904
0.0270402	0.00002	3E-05	0.0034507	0.0034	0.0075	0.03239	10.4779
0.0267841	0.00002	3E-05	0.00323	0.0034	0.0075	0.03209	11.8383
0.0264336	0.00002	3E-05	0.0030395	0.0034	0.0075	0.03172	13.2035
0.0262375	0.00002	3E-05	0.0028458	0.0034	0.0075	0.03148	14.9431
0.0260923	0.00002	3E-05	0.0027056	0.0034	0.0075	0.03131	16.4352
0.0262375	0.00002	3E-05	0.0025733	0.0034	0.0075	0.03139	18.2199
0.0262862	0.00002	3E-05	0.0024402	0.0034	0.0075	0.03139	20.2636
0.0262862	0.00002	3E-05	0.0023552	0.0034	0.0075	0.03136	21.7356
0.0284547	0.00002	3E-05	0.0022632	0.0034	0.0075	0.03451	4.8144
0.028284	0.00002	3E-05	0.0048356	0.0034	0.0075	0.03412	5.63632
0.0280595	0.00002	3E-05	0.0042735	0.0034	0.0075	0.03363	7.10939
0.0260923	0.00002	3E-05	0.0022411	0.0034	0.0075	0.03117	23.8411
0.0277839	0.00002	3E-05	0.0040519	0.0034	0.0075	0.03329	7.82336
0.0278935	0.00002	3E-05	0.0036311	0.0034	0.0075	0.03318	9.71405
0.0276211	0.00002	3E-05	0.003453	0.0034	0.0075	0.03288	10.6359
UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Svd	1.25	0.65000																
		L (m)																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tang (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Re	phi
1	925	557	0.06242	3.72536	26.2	22.3	3.9	24.25	0.0259555	4.8106	345.681	1.55E-05	0.00745	0.09963	0.053	3782	37.544	0.591
2	925	656	0.07808	4.66005	27.4	22.3	5.1	24.85	0.025999	5.7466	346.029	1.55E-05	0.00877	0.11746	0.053	3769	51.995	0.589
3	925	766	0.09376	5.55668	28	22.3	5.7	25.15	0.026021	7.4073	346.204	1.56E-05	0.01024	0.13722	0.053	3762	70.839	0.588
4	925	955	0.12551	7.49117	30.7	22.2	8.5	26.45	0.026116	8.8701	346.957	1.57E-05	0.01277	0.17145	0.053	3733	108.74	0.583
5	925	1064	0.14116	8.42491	32	22.3	9.7	27.15	0.026167	9.812	347.362	1.58E-05	0.01422	0.19124	0.053	3718	135.98	0.581
6	925	1166	0.15660	9.34630	33.1	22.3	10.8	27.7	0.026207	10.829	347.68	1.58E-05	0.01559	0.20977	0.053	3706	163.07	0.579
7	925	872	0.10945	6.53227	29.3	22.2	7.1	25.75	0.026065	8.0904	346.552	1.56E-05	0.01166	0.15637	0.053	3749	91.659	0.586
8	925	1240	0.17203	10.26723	34.5	22.5	12	28.5	0.026265	11.735	348.142	1.59E-05	0.01658	0.22338	0.053	3689	184.05	0.576
9	925	1367	0.18809	11.22584	34.8	22.7	12.1	28.75	0.026284	13.903	348.286	1.59E-05	0.01827	0.24636	0.053	3683	223.54	0.575
10	925	1454	0.20312	12.12320	35.3	22.6	12.7	28.95	0.026298	15.44	348.402	1.59E-05	0.01944	0.26212	0.053	3679	262.77	0.575
11	925	1574	0.22023	13.14390	35.4	22.8	12.6	29.1	0.026309	16.286	348.488	1.59E-05	0.02104	0.28382	0.053	3676	298.1	0.574
12	925	1646	0.23445	13.99280	35.6	23	12.6	29.3	0.026324	20.713	348.604	1.6E-05	0.022	0.29691	0.053	3671	323.64	0.574
13	925	1756	0.25093	14.97640	35.2	23.1	12.1	29.15	0.026313	24.716	348.517	1.59E-05	0.02347	0.31667	0.053	3675	368.48	0.574
14	925	1850	0.25093	14.97640	34.1	23.1	11	28.6	0.026273	27.231	348.2	1.59E-05	0.02473	0.33332	0.053	3686	408.66	0.576
15	925	1969	0.25093	14.97640	33.4	23.1	10.3	28.25	0.026247	29.11	347.998	1.59E-05	0.02632	0.35455	0.053	3694	464.36	0.577
16	925	2051	0.25093	14.97640	33.4	23.2	10.2	28.3	0.026251	29.392	348.027	1.59E-05	0.02742	0.36935	0.053	3693	503.78	0.577
17	925	1403	0.16484	9.83843	33	23.3	9.7	28.15	0.02624	13.343	347.94	1.59E-05	0.01875	0.25259	0.053	3696	235.82	0.578
18	925	1630	0.18007	10.74749	32.2	23.3	8.9	27.75	0.026211	17.374	347.709	1.58E-05	0.02179	0.29327	0.053	3705	318.63	0.579
19	925	1721	0.19511	11.64467	32.1	23.3	8.8	27.7	0.026207	20.63	347.68	1.58E-05	0.02301	0.30961	0.053	3706	355.26	0.579
20	925	1838	0.21055	12.56663	31.9	23.4	8.5	27.65	0.026203	24.878	347.651	1.58E-05	0.02457	0.33063	0.053	3707	405.26	0.579
f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tang (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Re	phi	

Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu
0.1813	0.0003	0.0001	0.0004	0.18158	0.87354
0.1386	0.0003	0.0001	0.0004	0.13901	0.79882
0.1241	0.0003	0.0001	0.0004	0.12446	0.92189
0.0832	0.0003	0.0001	0.0004	0.08379	0.74322
0.0729	0.0003	0.0001	0.0004	0.07358	0.72199
0.0655	0.0002	0.0001	0.0004	0.06623	0.71725
0.0996	0.0003	0.0001	0.0004	0.10009	0.8098
0.0569	0.0002	0.0001	0.0004	0.05977	0.70142
0.0584	0.0002	0.0001	0.0004	0.05929	0.82433
0.0557	0.0002	0.0001	0.0004	0.05657	0.87347
0.0561	0.0002	0.0001	0.0004	0.05701	1.04242
0.0561	0.0002	0.0001	0.0004	0.05701	1.18077
0.0584	0.0002	0.0001	0.0004	0.05929	1.48554
0.0643	0.0002	0.0001	0.0004	0.06506	1.7716
0.0687	0.0002	0.0001	0.0004	0.06938	2.01959
0.0693	0.0002	0.0001	0.0004	0.07004	2.05869
0.0729	0.0002	0.0001	0.0004	0.07358	0.98184
0.0794	0.0002	0.0001	0.0004	0.08008	1.39127
0.0804	0.0002	0.0001	0.0004	0.08097	1.87052
0.0832	0.0002	0.0001	0.0004	0.08379	2.08449
Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu

UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0291588	0.00002	3E-05	0.0089767	0.0034	0.0075	0.03799	1.42616
0.0284547	0.00002	3E-05	0.007622	0.0034	0.0075	0.03623	1.88368
0.0281153	0.00002	3E-05	0.0065274	0.0034	0.0075	0.03509	2.48577
0.0267335	0.00002	3E-05	0.0052356	0.0034	0.0075	0.03309	3.63102
0.0260442	0.00002	3E-05	0.0046992	0.0034	0.0075	0.0322	4.37856
0.0255271	0.00002	3E-05	0.0042882	0.0034	0.0075	0.03155	5.14538
0.0274602	0.00002	3E-05	0.0057339	0.0034	0.0075	0.034	3.11643
0.0248105	0.00002	3E-05	0.0040323	0.0034	0.0075	0.03084	5.67584
0.0245948	0.00002	3E-05	0.0036576	0.0034	0.0075	0.03048	6.81276
0.0244249	0.00002	3E-05	0.0034388	0.0034	0.0075	0.03024	7.64307
0.024299	0.00002	3E-05	0.0031766	0.0034	0.0075	0.03002	8.88907
0.0241331	0.00002	3E-05	0.0030377	0.0034	0.0075	0.02983	9.65386
0.0242573	0.00002	3E-05	0.0028474	0.0034	0.0075	0.02985	11.0009
0.0247238	0.00002	3E-05	0.0027027	0.0034	0.0075	0.03018	12.3612
0.0250301	0.00002	3E-05	0.0025394	0.0034	0.0075	0.03038	14.1057
0.0249859	0.00002	3E-05	0.0024378	0.0034	0.0075	0.03031	15.268
0.025119	0.00002	3E-05	0.0035638	0.0034	0.0075	0.03086	7.27705
0.0254811	0.00002	3E-05	0.0030675	0.0034	0.0075	0.03094	9.85896
0.0255271	0.00002	3E-05	0.0029053	0.0034	0.0075	0.03092	10.9831
0.0255732	0.00002	3E-05	0.0027203	0.0034	0.0075	0.03089	12.517
UTavg/Tavg	Uiff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Svd	1.25																	0.65000	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	kW/mK	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	N ^o 2	Rs	phi	
1	1202	502	0.07809	4.66081	30.4	24	6.4	27.2	0.026171	4.5507	347.391	1.58E-05	0.00671	0.06944	0.069	4830	23.29	0.755	
2	1202	554	0.08600	5.13299	31.1	24	7.1	27.55	0.026196	4.8705	347.594	1.58E-05	0.00741	0.07668	0.069	4820	28.34	0.753	
3	1202	601	0.09386	5.60186	31.6	24.1	7.5	27.85	0.026218	5.6986	347.767	1.58E-05	0.00803	0.08323	0.069	4811	33.327	0.752	
4	1202	650	0.10168	6.06882	32.2	24.2	8	28.2	0.026244	6.1653	347.969	1.59E-05	0.00869	0.09006	0.069	4802	38.948	0.75	
5	1202	704	0.10951	6.53588	32.8	24.2	8.6	28.5	0.026265	6.6366	348.142	1.59E-05	0.00941	0.09769	0.069	4793	45.653	0.749	
6	1202	749	0.11735	7.00370	33.6	24.2	9.4	28.9	0.026295	6.9833	348.373	1.59E-05	0.01001	0.1039	0.069	4782	51.623	0.747	
7	1202	800	0.12506	7.46402	34.2	24.3	9.9	29.25	0.02632	7.602	348.575	1.6E-05	0.01069	0.11104	0.069	4772	68.841	0.746	
8	1202	903	0.13289	7.93145	34	24.3	9.7	29.15	0.026313	8.6481	348.517	1.59E-05	0.01207	0.12532	0.069	4775	74.986	0.746	
9	1202	949	0.14085	8.40666	34.3	24.2	10.1	29.25	0.02632	9.3281	348.575	1.6E-05	0.01269	0.13172	0.069	4772	82.8	0.746	
10	1202	998	0.14874	8.87754	34.9	24.2	10.7	29.55	0.026342	9.8108	348.748	1.6E-05	0.01334	0.13859	0.069	4764	91.501	0.744	
11	1202	1048	0.15656	9.34395	35.1	23.9	11.2	29.5	0.026338	10.385	348.719	1.6E-05	0.01401	0.14552	0.069	4765	100.91	0.745	
12	1202	1101	0.16428	9.80463	36.9	24	12.9	30.45	0.026407	9.8016	348.266	1.61E-05	0.01472	0.15312	0.069	4739	111.11	0.74	
13	1202	1148	0.17205	10.26875	37.4	24	13.4	30.7	0.026426	10.449	349.409	1.61E-05	0.01535	0.15972	0.069	4732	120.72	0.739	
14	1202	1200	0.17992	10.73818	38.6	24	14.6	31.3	0.026469	10.489	349.754	1.61E-05	0.01604	0.16712	0.069	4716	131.71	0.737	
15	1202	1247	0.18774	11.20505	39.7	24.1	15.6	31.9	0.026513	10.651	350.099	1.62E-05	0.01667	0.17384	0.068	4699	142.01	0.734	
16	1202	1300	0.19547	11.66650	39.8	24.1	15.7	31.95	0.026516	11.471	350.127	1.62E-05	0.01738	0.18124	0.068	4698	154.32	0.734	
17	1202	1655	0.20330	12.13360	40.4	24.1	16.3	32.25	0.026538	11.842	350.289	1.62E-05	0.02212	0.23085	0.068	4690	248.93	0.733	
18	1202	1405	0.20151	12.02710	40.7	24.2	16.5	32.45	0.026553	11.886	350.414	1.63E-05	0.01876	0.19604	0.068	4684	180.03	0.732	
19	1202	1448	0.21956	13.10400	41.7	24.3	17.4	33	0.026592	13.021	350.729	1.63E-05	0.01936	0.20223	0.068	4669	180.86	0.73	
20	1202	1504	0.22719	13.55980	42.4	24.3	18.1	33.35	0.026618	13.391	350.93	1.63E-05	0.0201	0.21017	0.068	4650	205.84	0.728	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	kW/mK	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	N ^o 2	Rs	phi	

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.1105	0.0003	0.0001	0.0004	0.11094	0.50485
0.0996	0.0003	0.0001	0.0004	0.10009	0.49751
0.0943	0.0003	0.0001	0.0004	0.09481	0.5309
0.0884	0.0003	0.0001	0.0004	0.08895	0.54753
0.0822	0.0003	0.0001	0.0004	0.08283	0.54962
0.0752	0.0003	0.0001	0.0004	0.07589	0.52842
0.0714	0.0003	0.0001	0.0004	0.07212	0.54107
0.0729	0.0003	0.0001	0.0004	0.07358	0.63634
0.07	0.0003	0.0001	0.0004	0.07072	0.65971
0.0661	0.0003	0.0001	0.0004	0.06684	0.65575
0.0631	0.0002	0.0001	0.0004	0.06392	0.68385
0.0548	0.0002	0.0001	0.0004	0.05572	0.55173
0.0528	0.0002	0.0001	0.0004	0.05371	0.5612
0.0484	0.0002	0.0001	0.0004	0.04946	0.51778
0.0453	0.0002	0.0001	0.0004	0.04642	0.49444
0.045	0.0002	0.0001	0.0004	0.04614	0.52928
0.0434	0.0002	0.0001	0.0004	0.04452	0.53167
0.0429	0.0002	0.0001	0.0004	0.04401	0.50983
0.0406	0.0002	0.0001	0.0004	0.04185	0.54499
0.0391	0.0002	0.0001	0.0004	0.04033	0.54005
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	Uiff	Uw/v	Uwmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0259953	0.00002	3E-05	0.0099602	0.0034	0.0075	0.03665	0.85353
0.0256661	0.00002	3E-05	0.0090263	0.0034	0.0075	0.03543	1.00397
0.0253896	0.00002	3E-05	0.0083195	0.0034	0.0075	0.03452	1.15058
0.0250745	0.00002	3E-05	0.0076923	0.0034	0.0075	0.0337	1.31264
0.0248105	0.00002	3E-05	0.0071023	0.0034	0.0075	0.03298	1.5057
0.0244671	0.00002	3E-05	0.0066756	0.0034	0.0075	0.03236	1.67067
0.0241744	0.00002	3E-05	0.00625	0.0034	0.0075	0.0318	1.871
0.0242573	0.00002	3E-05	0.0055371	0.0034	0.0075	0.03133	2.34924
0.0241744	0.00002	3E-05	0.0052687	0.0034	0.0075	0.03108	2.57331
0.0239289	0.00002	3E-05	0.00501	0.0034	0.0075	0.03072	2.61051
0.0239695	0.00002	3E-05	0.004771	0.0034	0.0075	0.03059	3.08738
0.0232217	0.00002	3E-05	0.0045413	0.0034	0.0075	0.02987	3.31881
0.0230326	0.00002	3E-05	0.0043554	0.0034	0.0075	0.02961	3.57475
0.0225911	0.00002	3E-05	0.0041667	0.0034	0.0075	0.02916	3.84048
0.0221661	0.00002	3E-05	0.0040096	0.0034	0.0075	0.02874	4.08172
0.0221315	0.00002	3E-05	0.0038462	0.0034	0.0075	0.02863	4.41755
0.0219256	0.00002	3E-05	0.0030211	0.0034	0.0075	0.02607	7.01437
0.0217904	0.00002	3E-05	0.0035587	0.0034	0.0075	0.02821	5.07912
0.0214273	0.00002	3E-05	0.003453	0.0034	0.0075	0.02786	5.32384
0.0212024	0.00002	3E-05	0.0033245	0.0034	0.0075	0.02764	5.69012
UTavg/Tavg	Uiff	Uw/v	Uwmic/Vmic	UG/G	US/S	URs/Rs	URs

SUD		0.65000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	v^2	Rs	phi
1	1461	100	0.05462	3.26000	29.5	23.7	5.8	26.6	0.026127	2.4608	347.044	1.57E-05	0.00134	0.01137	0.084	5891	0.7616	0.921
2	1461	150	0.06352	3.79116	31.2	23.7	7.5	27.45	0.026189	2.6676	347.536	1.58E-05	0.00201	0.01708	0.084	5892	1.7087	0.916
3	1461	202	0.07033	4.19783	31.4	23.7	7.7	27.55	0.026196	3.0653	347.594	1.58E-05	0.0027	0.023	0.084	5859	3.0988	0.915
4	1461	250	0.07812	4.66223	32.7	23.7	9	28.2	0.026244	3.229	347.969	1.59E-05	0.00334	0.0285	0.084	5836	4.7401	0.912
5	1461	300	0.08594	5.12919	33.7	23.7	10	28.7	0.02628	3.6126	348.258	1.59E-05	0.00401	0.03423	0.084	5819	6.8171	0.909
6	1461	347	0.09376	5.59607	35.2	23.7	11.5	29.45	0.026335	3.6282	348.69	1.6E-05	0.00464	0.03964	0.084	5794	8.1031	0.905
7	1461	401	0.10161	6.06426	35.1	23.7	11.4	29.4	0.026331	4.2887	348.661	1.6E-05	0.00536	0.0458	0.084	5795	12.156	0.906
8	1461	450	0.10951	6.53578	35.7	23.7	12	29.7	0.026353	4.7386	348.834	1.6E-05	0.00602	0.05143	0.084	5785	15.3	0.904
9	1461	497	0.11734	7.00322	36	23.7	12.3	29.85	0.026364	6.3088	348.92	1.6E-05	0.00664	0.05681	0.084	5780	18.655	0.903
10	1461	548	0.12518	7.47142	36.7	23.7	13	30.2	0.026389	6.7094	349.122	1.6E-05	0.00733	0.06268	0.083	5768	22.66	0.901
11	1461	598	0.13293	7.93373	37.3	23.7	13.6	30.5	0.026411	6.1487	349.294	1.61E-05	0.00799	0.06843	0.083	5758	26.864	0.9
12	1461	647	0.14077	8.40193	37.8	23.7	14.1	30.75	0.026429	6.6467	349.438	1.61E-05	0.00865	0.07407	0.083	5750	31.644	0.898
13	1461	699	0.14881	8.88134	38.3	23.7	14.6	31	0.026447	7.1676	349.582	1.61E-05	0.00934	0.08005	0.083	5742	36.796	0.897
14	1461	747	0.15643	9.33634	38.7	23.7	15	31.2	0.026462	7.7054	349.697	1.61E-05	0.00999	0.08558	0.083	5735	42.001	0.896
15	1461	799	0.16425	9.80293	38.2	23.7	14.5	30.95	0.026444	8.7837	349.553	1.61E-05	0.01068	0.0915	0.083	5743	48.082	0.897
16	1461	850	0.17207	10.26989	39.3	23.7	15.6	31.5	0.026484	8.9574	349.869	1.62E-05	0.01136	0.09743	0.083	5725	64.341	0.895
17	1461	903	0.17989	10.73666	40.2	23.7	16.5	31.95	0.026516	9.2447	350.127	1.62E-05	0.01207	0.10358	0.083	5710	61.259	0.892
18	1461	944	0.18769	11.20182	41.6	23.8	17.8	32.7	0.026571	9.309	350.557	1.63E-05	0.01262	0.10841	0.083	5685	66.823	0.888
19	1461	1009	0.19550	11.66841	40.9	23.8	17.1	32.35	0.026545	10.624	350.357	1.62E-05	0.01349	0.11581	0.083	5697	76.409	0.89
20	1461	1140	0.20333	12.13556	41.7	23.8	17.9	32.75	0.026574	10.863	350.586	1.63E-05	0.01524	0.13093	0.083	5684	87.44	0.888
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	v^2	Rs	phi

U _{GT} /T	U _{VR} /R	U _{VH} /H	U _k /k	U _{Nu} /Nu	U _{Nu}
0.1219	0.0003	0.0001	0.0004	0.12232	0.30101
0.0943	0.0003	0.0001	0.0004	0.09481	0.24343
0.0918	0.0003	0.0001	0.0004	0.09238	0.28316
0.0786	0.0003	0.0001	0.0004	0.0792	0.25575
0.0707	0.0003	0.0001	0.0004	0.07142	0.25085
0.0615	0.0003	0.0001	0.0004	0.0623	0.22803
0.062	0.0003	0.0001	0.0004	0.06283	0.27009
0.0589	0.0003	0.0001	0.0004	0.05977	0.28329
0.0575	0.0003	0.0001	0.0004	0.05835	0.30967
0.0544	0.0003	0.0001	0.0004	0.05531	0.31577
0.052	0.0003	0.0001	0.0004	0.05295	0.32557
0.0501	0.0003	0.0001	0.0004	0.05114	0.33991
0.0484	0.0003	0.0001	0.0004	0.04946	0.35448
0.0471	0.0002	0.0001	0.0004	0.04819	0.37134
0.0488	0.0002	0.0001	0.0004	0.04978	0.43778
0.0453	0.0002	0.0001	0.0004	0.04642	0.41581
0.0429	0.0002	0.0001	0.0004	0.04401	0.40685
0.0397	0.0002	0.0001	0.0004	0.04097	0.38137
0.0414	0.0002	0.0001	0.0004	0.04255	0.44777
0.0395	0.0002	0.0001	0.0004	0.04075	0.4427
U _{GT} /T	U _{VR} /R	U _{VH} /H	U _k /k	U _{Nu} /Nu	U _{Nu}

U _{Tavg} /T _{avg}	U _{iff}	U _v /v	U _{mic} /V _{mic}	U _G /G	U _S /S	U _R /R _s	U _R
0.0265627	0.00002	3E-05	0.05	0.0034	0.0075	0.10477	0.07979
0.0257596	0.00002	3E-05	0.0333333	0.0034	0.0075	0.07334	0.12539
0.0256661	0.00002	3E-05	0.0247525	0.0034	0.0075	0.05814	0.18021
0.0250745	0.00002	3E-05	0.02	0.0034	0.0075	0.04959	0.23697
0.0246376	0.00002	3E-05	0.0166667	0.0034	0.0075	0.04459	0.304
0.0240102	0.00002	3E-05	0.0144092	0.0034	0.0075	0.04096	0.37283
0.024051	0.00002	3E-05	0.0124688	0.0034	0.0075	0.03835	0.46628
0.0238081	0.00002	3E-05	0.0111111	0.0034	0.0075	0.03648	0.5592
0.0236884	0.00002	3E-05	0.0100604	0.0034	0.0075	0.03516	0.65598
0.0234139	0.00002	3E-05	0.0091241	0.0034	0.0075	0.03394	0.76901
0.0231836	0.00002	3E-05	0.0083612	0.0034	0.0075	0.03298	0.88922
0.0229951	0.00002	3E-05	0.007728	0.0034	0.0075	0.03222	1.01633
0.0228097	0.00002	3E-05	0.0071531	0.0034	0.0075	0.03155	1.16087
0.0226635	0.00002	3E-05	0.0066934	0.0034	0.0075	0.03104	1.30356
0.0228465	0.00002	3E-05	0.0062578	0.0034	0.0075	0.03081	1.48124
0.0224476	0.00002	3E-05	0.0058824	0.0034	0.0075	0.03021	1.64172
0.0221315	0.00002	3E-05	0.0055371	0.0034	0.0075	0.02971	1.82022
0.0216239	0.00002	3E-05	0.0052966	0.0034	0.0075	0.02916	1.9485
0.0218578	0.00002	3E-05	0.0049554	0.0034	0.0075	0.02909	2.223
0.0215908	0.00002	3E-05	0.004386	0.0034	0.0075	0.02852	2.77927
U _{Tavg} /T _{avg}	U _{iff}	U _v /v	U _{mic} /V _{mic}	U _G /G	U _S /S	U _R /R _s	U _R

#	S/d	L (m)										#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	K(W/mK)	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	M ²	Rs	phi
		0.24000																												
1	383	402	0.13827	8.25489	37	25.2	11.8	31.1	0.026455	7.657	349.639	1.613E-05	0.00537	0.1756	0.021853	1504.297	46.4116	0.94019												
2	383	502	0.14735	8.79721	36.9	24.4	12.5	30.65	0.026422	8.219	349.381	1.608E-05	0.00671	0.2192	0.021869	1508.233	72.4558	0.94265												
3	383	601	0.15565	9.29271	35.2	24.4	10.8	29.8	0.02636	10.64	348.892	1.6E-05	0.00803	0.262	0.021899	1515.713	104.075	0.94732												
4	383	703	0.16421	9.80332	35.9	24.3	11.6	30.1	0.026382	11.02	349.064	1.603E-05	0.0094	0.3067	0.021889	1513.066	142.282	0.94667												
5	383	800	0.17261	10.30523	35.4	24.4	11	29.9	0.026367	12.84	348.949	1.601E-05	0.01069	0.3489	0.021896	1514.829	184.36	0.94677												
6	383	902	0.18171	10.84818	34.5	24.4	10.1	29.45	0.026335	16.62	348.69	1.597E-05	0.01206	0.393	0.021912	1518.81	234.636	0.94926												
7	383	1006	0.19035	11.36426	34.5	24.4	10.1	29.45	0.026335	17.03	348.69	1.597E-05	0.01345	0.4384	0.021912	1518.81	281.862	0.94926												
8	383	1098	0.19899	11.88023	34.2	24.4	9.8	29.3	0.026324	19.19	348.604	1.596E-05	0.01468	0.4783	0.021917	1520.141	347.818	0.95009												
9	383	1205	0.20742	12.38318	34.2	24.5	9.7	29.35	0.026327	21.06	348.632	1.596E-05	0.01611	0.525	0.021916	1519.697	418.868	0.94981												
10	383	1301	0.21629	12.91290	34.2	24.6	9.6	29.4	0.026331	23.14	348.661	1.597E-05	0.01739	0.5669	0.021914	1519.254	488.183	0.94953												
11	383	1402	0.22480	13.42110	33.4	24.4	9	28.9	0.026295	26.7	348.373	1.592E-05	0.01874	0.6104	0.021932	1523.699	667.664	0.95231												
12	383	1503	0.23405	13.97340	33.5	24.6	8.9	29.05	0.026305	29.26	348.459	1.593E-05	0.02009	0.6545	0.021927	1522.363	862.14	0.95148												
13	383	1696	0.24214	14.45640	33.4	24.6	8.8	29	0.026302	31.67	348.431	1.593E-05	0.02133	0.6949	0.021928	1522.808	736.434	0.95176												
14	383	1603	0.25115	14.99400	34	24.6	9.4	29.3	0.026324	31.87	348.604	1.596E-05	0.02143	0.6983	0.021917	1520.141	741.335	0.95009												
15	383	1696	0.25980	15.51060	34.2	24.5	9.7	29.35	0.026327	33.04	348.632	1.596E-05	0.02267	0.7389	0.021916	1519.697	828.744	0.94981												
16	383	1800	0.26823	16.01355	34.2	24.7	9.5	29.45	0.026335	35.95	348.69	1.597E-05	0.02406	0.7844	0.021912	1518.81	934.388	0.94926												
17	383	1894	0.27757	16.57110	34.3	24.5	9.8	29.4	0.026331	37.33	348.661	1.597E-05	0.02532	0.8252	0.021914	1519.254	1034.68	0.94953												
18	383	2005	0.28624	17.08870	34.4	24.5	9.9	29.45	0.026335	39.29	348.69	1.597E-05	0.0268	0.8737	0.021912	1518.81	1159.34	0.94926												
19	383	2104	0.29471	17.59480	34.8	24.4	10.4	29.6	0.026345	39.63	348.776	1.599E-05	0.02813	0.917	0.021907	1517.481	1278.17	0.94843												
20	383	2200	0.30289	18.08310	35	24.5	10.5	29.75	0.026356	41.45	348.863	1.6E-05	0.02941	0.9591	0.021901	1516.154	1394.76	0.9476												

U _{dt} /T	U _{VR} /R	U _{VH} /V _H	U _k /k	U _{Nu} /Nu	U _{Nu}
0.06	0.00025	0.00012	4E-04	0.0608	0.47
0.067	0.00025	0.00012	4E-04	0.0574	0.47
0.065	0.00025	0.000119	4E-04	0.0662	0.7
0.061	0.00025	0.000119	4E-04	0.0618	0.68
0.064	0.00024	0.000119	4E-04	0.0651	0.84
0.07	0.00024	0.000119	4E-04	0.0707	1.1
0.07	0.00024	0.000119	4E-04	0.0707	1.2
0.072	0.00024	0.000118	4E-04	0.0728	1.4
0.073	0.00024	0.000118	4E-04	0.0736	1.55
0.074	0.00024	0.000118	4E-04	0.0743	1.72
0.079	0.00024	0.000118	4E-04	0.0792	2.11
0.079	0.00024	0.000118	4E-04	0.0801	2.34
0.08	0.00023	0.000118	4E-04	0.081	2.56
0.075	0.00023	0.000118	4E-04	0.0759	2.42
0.073	0.00023	0.000118	4E-04	0.0736	2.43
0.074	0.00023	0.000117	4E-04	0.0751	2.7
0.072	0.00023	0.000117	4E-04	0.0728	2.72
0.071	0.00023	0.000117	4E-04	0.0721	2.83
0.068	0.00023	0.000117	4E-04	0.0667	2.72
0.067	0.00023	0.000117	4E-04	0.0681	2.82
U _{dt} /T	U _{VR} /R	U _{VH} /V _H	U _k /k	U _{Nu} /Nu	U _{Nu}

U _{Tavg} /T _{avg}	U _{if}	U _{v/v}	U _{mic} /V _{mic}	U _{G/G}	U _{S/S}	U _{Rs/Rs}	U _{Rs}
0.0227363	0.00002	3.1E-05	0.0124378	0.0034	0.00749	0.0374991	1.74039
0.0230701	0.00002	3.1E-05	0.0098602	0.0034	0.00749	0.0346338	2.50942
0.0237282	0.00002	3.1E-05	0.0083195	0.0034	0.00749	0.0333216	3.46794
0.0234917	0.00002	3.1E-05	0.0071124	0.0034	0.00749	0.0320101	4.55477
0.0236488	0.00002	3.1E-05	0.00625	0.0034	0.00749	0.0314001	5.78893
0.0240102	0.00002	3.1E-05	0.0055432	0.0034	0.00749	0.0311423	7.30713
0.0240102	0.00002	3.1E-05	0.0049702	0.0034	0.00749	0.030753	8.97564
0.0241331	0.00002	3.1E-05	0.0045537	0.0034	0.00749	0.0305908	10.64
0.024092	0.00002	3.1E-05	0.0041494	0.0034	0.00749	0.0303272	12.7028
0.024051	0.00002	3.1E-05	0.0038432	0.0034	0.00749	0.0301327	14.7106
0.0244671	0.00002	3.1E-05	0.0035663	0.0034	0.00749	0.0303309	17.2174
0.0243408	0.00002	3.1E-05	0.0033267	0.0034	0.00749	0.0301196	19.6422
0.0243828	0.00002	3.1E-05	0.0031328	0.0034	0.00749	0.0300703	22.1147
0.0241331	0.00002	3.1E-05	0.0031192	0.0034	0.00749	0.0298625	22.1381
0.024092	0.00002	3.1E-05	0.0029481	0.0034	0.00749	0.0297586	24.8929
0.0240102	0.00002	3.1E-05	0.0027778	0.0034	0.00749	0.0296277	27.6838
0.024051	0.00002	3.1E-05	0.0026399	0.0034	0.00749	0.0296104	30.6366
0.0240102	0.00002	3.1E-05	0.0024938	0.0034	0.00749	0.0295264	34.2312
0.0238885	0.00002	3.1E-05	0.0023764	0.0034	0.00749	0.0293887	37.505
0.0237681	0.00002	3.1E-05	0.0022727	0.0034	0.00749	0.029258	40.8077
U _{Tavg} /T _{avg}	U _{if}	U _{v/v}	U _{mic} /V _{mic}	U _{G/G}	U _{S/S}	U _{Rs/Rs}	U _{Rs}

Sld		L (m)																		0.65																	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	M^2	Re	phi																			
1	676	923.7	0.20355	12.17028	40.3	26	14.3	33.15	0.026503	13.64	350.815	1.632E-05	0.01235	0.2294	0.038441	2623.836	138.121	1.6399																			
2	676	1222.3	0.24323	14.54290	37.8	24.8	13	31.3	0.026469	21.63	349.754	1.614E-05	0.01634	0.3027	0.038557	2652.027	242.876	1.65752																			
3	676	1562	0.28153	17.43050	39.1	24.3	14.8	31.7	0.026498	27.13	349.984	1.618E-05	0.02088	0.3871	0.038532	2645.89	386.4	1.65368																			
4	676	2180	0.32529	19.44910	38.7	25.5	13.2	32.1	0.026527	37.84	350.213	1.622E-05	0.02914	0.5406	0.038507	2639.776	771.347	1.64986																			
5	676	2067	0.35679	21.33245	43.4	25.9	17.5	34.65	0.026712	34.1	351.673	1.646E-05	0.02763	0.5147	0.038347	2601.339	689.065	1.62584																			
6	676	2394	0.35613	21.29310	40.4	24.9	15.5	32.65	0.026567	38.56	350.529	1.627E-05	0.032	0.5942	0.038472	2631.407	928.84	1.64463																			
7	676	2017	0.31074	18.57910	39.8	25.3	14.5	32.55	0.02656	31.39	350.471	1.626E-05	0.02896	0.5005	0.038478	2632.925	658.668	1.64556																			
8	676	1111	0.17787	10.63470	34.8	24.9	9.9	29.85	0.026364	16.18	348.92	1.601E-05	0.01485	0.2745	0.03865	2674.473	201.476	1.67155																			
9	676	1045	0.15934	9.52690	33.2	24.7	8.5	28.95	0.026298	14.22	348.402	1.593E-05	0.01397	0.2578	0.038707	2688.562	178.666	1.68035																			
10	676	1112	0.11866	7.09490	29.1	24.4	4.7	26.75	0.026138	14.36	347.131	1.572E-05	0.01486	0.2733	0.038849	2723.523	203.438	1.7022																			
11	676	1657	0.20400	12.19721	33.2	25.1	8.1	29.15	0.026313	24.45	348.517	1.594E-05	0.02215	0.4089	0.038694	2685.421	448.862	1.67839																			
12	676	1509	0.23286	13.92270	36.1	25.8	10.3	30.95	0.026444	24.93	349.553	1.611E-05	0.02017	0.3735	0.03858	2657.417	370.654	1.66089																			
13	676	2578	0.33616	20.09920	38.6	25.7	12.9	32.15	0.026531	41.34	350.242	1.622E-05	0.03446	0.6393	0.038504	2639.013	1078.67	1.64938																			
14	676	1925	0.25878	15.47270	37.2	25.7	11.5	31.45	0.02648	27.54	349.84	1.616E-05	0.02573	0.4768	0.038548	2649.723	602.429	1.65608																			
15	676	985	0.22283	13.32310	41.9	25.8	16.1	33.85	0.026554	14.49	351.216	1.638E-05	0.01317	0.2449	0.038397	2613.298	166.788	1.63331																			
16	676	767	0.18213	10.88946	40.8	25.5	15.3	33.15	0.026603	10.2	350.815	1.632E-05	0.01025	0.1905	0.038441	2623.836	95.2332	1.6399																			
17	676	1268	0.20938	12.51920	37.1	25.5	11.6	31.3	0.026469	17.88	349.754	1.614E-05	0.01695	0.314	0.038557	2652.027	261.485	1.65752																			
18	676	1257	0.24112	14.41700	41.3	25.1	16.2	33.2	0.026607	16.89	350.844	1.632E-05	0.0168	0.3122	0.038438	2623.081	256.749	1.63943																			
19	676	1328	0.27489	16.43560	43.3	25.5	17.8	34.4	0.026994	19.91	351.53	1.644E-05	0.01775	0.3305	0.038363	2605.066	284.606	1.62817																			
20	676	1417	0.16747	10.01310	32.3	25	7.3	28.65	0.026276	18.31	348.229	1.59E-05	0.01894	0.3494	0.038726	2693.286	328.742	1.6833																			

Ud/Tt	UVRVR	UVHVR	Uk/k	UNu/NU	UNu
0.049	0.00024	0.000118	4E-04	0.0505	0.69
0.054	0.00023	0.000118	4E-04	0.0553	1.19
0.048	0.00023	0.000117	4E-04	0.0488	1.32
0.054	0.00023	0.000117	4E-04	0.0545	2.06
0.04	0.00023	0.000117	4E-04	0.0416	1.42
0.046	0.00023	0.000117	4E-04	0.0467	1.8
0.049	0.00023	0.000117	4E-04	0.0488	1.56
0.071	0.00024	0.000119	4E-04	0.0721	1.09
0.083	0.00025	0.000119	4E-04	0.0838	1.19
0.15	0.00026	0.000121	4E-04	0.1508	2.16
0.087	0.00024	0.000118	4E-04	0.0879	2.15
0.069	0.00024	0.000118	4E-04	0.0694	1.73
0.055	0.00023	0.000117	4E-04	0.0557	2.3
0.061	0.00023	0.000118	4E-04	0.0623	1.72
0.044	0.00024	0.000118	4E-04	0.045	0.65
0.046	0.00024	0.000119	4E-04	0.0473	0.48
0.061	0.00024	0.000118	4E-04	0.0618	1.1
0.044	0.00023	0.000118	4E-04	0.0448	0.76
0.04	0.00023	0.000117	4E-04	0.041	0.82
0.097	0.00025	0.000119	4E-04	0.0974	1.78
Ud/Tt	UVRVR	UVHVR	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lif	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0213303	0.00002	3.1E-05	0.005413	0.0034	0.00749	0.0290281	4.00939
0.0225911	0.00002	3.1E-05	0.0040906	0.0034	0.00749	0.0291159	7.07447
0.022306	0.00002	3.1E-05	0.003201	0.0034	0.00749	0.0284427	11.2747
0.022028	0.00002	3.1E-05	0.0022936	0.0034	0.00749	0.0278697	21.4972
0.0204069	0.00002	3E-05	0.002419	0.0034	0.00749	0.0266513	18.3645
0.021657	0.00002	3.1E-05	0.0020886	0.0034	0.00749	0.0275122	25.5571
0.0217235	0.00002	3.1E-05	0.0024789	0.0034	0.00749	0.0276936	18.2658
0.0236884	0.00002	3.1E-05	0.0045005	0.0034	0.00749	0.0302093	6.08645
0.0244249	0.00002	3.1E-05	0.0047847	0.0034	0.00749	0.0309612	5.53139
0.0264336	0.00002	3.2E-05	0.0044964	0.0034	0.00749	0.0324045	6.5923
0.0242573	0.00002	3.1E-05	0.0030175	0.0034	0.00749	0.0299213	13.4335
0.0228465	0.00002	3.1E-05	0.0033135	0.0034	0.00749	0.0289193	10.719
0.0219938	0.00002	3.1E-05	0.0019395	0.0034	0.00749	0.0277348	29.9139
0.0224833	0.00002	3.1E-05	0.0025974	0.0034	0.00749	0.028336	17.0705
0.0208892	0.00002	3.1E-05	0.0050761	0.0034	0.00749	0.0284583	4.46193
0.0213303	0.00002	3.1E-05	0.0065189	0.0034	0.00749	0.0299235	2.84971
0.0225911	0.00002	3.1E-05	0.0039432	0.0034	0.00749	0.0290344	7.59206
0.0212982	0.00002	3.1E-05	0.0039777	0.0034	0.00749	0.0280597	7.17625
0.0205552	0.00002	3E-05	0.0037651	0.0034	0.00749	0.02738	7.79253
0.0246806	0.00002	3.1E-05	0.0035286	0.0034	0.00749	0.0304858	10.022
UTavg/Tavg	U/lif	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

U _g /T	UVR/R	UVH/VH	U _k /k	U _{Nu} /Nu	U _{Nu}
0.136	0.00027	0.000122	4E-04	0.1363	1.29
0.129	0.00027	0.000121	4E-04	0.129	1.26
0.131	0.00026	0.000121	4E-04	0.1313	1.43
0.118	0.00026	0.000121	4E-04	0.1183	1.33
0.091	0.00025	0.00012	4E-04	0.0912	1.02
0.084	0.00025	0.00012	4E-04	0.0848	1
0.082	0.00025	0.000119	4E-04	0.0828	1.17
0.074	0.00024	0.000119	4E-04	0.0743	1.17
0.067	0.00024	0.000118	4E-04	0.0681	1.17
0.056	0.00024	0.000118	4E-04	0.0566	1.03
0.044	0.00023	0.000118	4E-04	0.0456	0.87
0.04	0.00023	0.000117	4E-04	0.0416	0.93
0.034	0.00023	0.000117	4E-04	0.0356	0.84
0.04	0.00023	0.000117	4E-04	0.0412	1.26
0.041	0.00023	0.000117	4E-04	0.0421	1.32
0.052	0.00023	0.000118	4E-04	0.0533	1.28
0.052	0.00023	0.000117	4E-04	0.0526	1.42
0.051	0.00023	0.000117	4E-04	0.0518	1.46
0.057	0.00023	0.000118	4E-04	0.0574	1.4
0.041	0.00023	0.000117	4E-04	0.0421	1.33
U _g /T	UVR/R	UVH/VH	U _k /k	U _{Nu} /Nu	U _{Nu}

U _{Tavg} /T _{avg}	U _{iff}	U _w /w	U _{vmic} /V _{mic}	U _G /G	U _S /S	U _S /R _S	U _R /S
0.0248979	0.00002	3.1E-05	0.0059952	0.0034	0.00749	0.0321578	3.42624
0.0247671	0.00002	3.1E-05	0.0059275	0.0034	0.00749	0.0319326	3.59951
0.0247238	0.00002	3.1E-05	0.0057143	0.0034	0.00749	0.031817	3.72954
0.0243828	0.00002	3.1E-05	0.0055494	0.0034	0.00749	0.0314348	3.903
0.0236468	0.00002	3.1E-05	0.005637	0.0034	0.00749	0.0309324	3.71372
0.0234917	0.00002	3.1E-05	0.0053879	0.0034	0.00749	0.0306337	4.02369
0.0234917	0.00002	3.1E-05	0.0047125	0.0034	0.00749	0.0301851	5.18265
0.0230326	0.00002	3.1E-05	0.0044326	0.0034	0.00749	0.029657	5.74668
0.0226272	0.00002	3.1E-05	0.004	0.0034	0.00749	0.0290936	6.91334
0.0217235	0.00002	3.1E-05	0.0037821	0.0034	0.00749	0.0282768	7.49116
0.0208277	0.00002	3E-05	0.0036206	0.0034	0.00749	0.0275077	7.92471
0.0200028	0.00002	3E-05	0.0033069	0.0034	0.00749	0.0267264	9.19773
0.0189317	0.00002	3E-05	0.0031928	0.0034	0.00749	0.0258773	9.50612
0.0200596	0.00002	3E-05	0.00249	0.0034	0.00749	0.0264128	16.0356
0.0199464	0.00002	3E-05	0.0022841	0.0034	0.00749	0.0262521	18.9315
0.021657	0.00002	3.1E-05	0.0028281	0.0034	0.00749	0.0277752	13.1574
0.021657	0.00002	3.1E-05	0.0026056	0.0034	0.00749	0.027688	15.4522
0.0215251	0.00002	3.1E-05	0.0026263	0.0034	0.00749	0.0275551	16.363
0.0219938	0.00002	3.1E-05	0.0029223	0.0034	0.00749	0.0280772	12.4723
0.0205254	0.00002	3E-05	0.0023052	0.0034	0.00749	0.028702	18.9524
U _{Tavg} /T _{avg}	U _{iff}	U _w /w	U _{vmic} /V _{mic}	U _G /G	U _S /S	U _S /R _S	U _R /S

UGT/T	UVR/VR	UVH/VH	Uk/k	UNu/NU	UNu
0.124	0.00027	0.000122	4E-04	0.1245	1.07
0.097	0.00025	0.00012	4E-04	0.0974	1.17
0.067	0.00025	0.000119	4E-04	0.0681	0.89
0.052	0.00024	0.000118	4E-04	0.0526	0.75
0.045	0.00024	0.000118	4E-04	0.0464	0.79
0.037	0.00023	0.000117	4E-04	0.0387	0.71
0.037	0.00023	0.000117	4E-04	0.038	0.86
0.037	0.00023	0.000117	4E-04	0.0382	1.07
0.079	0.00025	0.000119	4E-04	0.0792	1.2
0.129	0.00025	0.00012	4E-04	0.129	2.06
0.124	0.00026	0.000121	4E-04	0.1245	1.51
0.1	0.00025	0.000119	4E-04	0.1001	1.56
0.065	0.00024	0.000119	4E-04	0.0656	1
0.057	0.00024	0.000118	4E-04	0.0584	1.09
0.05	0.00023	0.000118	4E-04	0.0508	1.1
0.045	0.00023	0.000117	4E-04	0.0461	1.15
0.139	0.00026	0.000121	4E-04	0.139	1.6
0.051	0.00023	0.000118	4E-04	0.0518	1.22
0.058	0.00024	0.000118	4E-04	0.0593	1.22
0.047	0.00023	0.000117	4E-04	0.0482	1.19
UGT/T	UVR/VR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	Uff	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0256661	0.00002	3.2E-05	0.0070225	0.0034	0.00749	0.0335627	2.04152
0.0248541	0.00002	3.1E-05	0.0046041	0.0034	0.00749	0.0311924	4.40402
0.0234527	0.00002	3.1E-05	0.0042589	0.0034	0.00749	0.0298836	4.90953
0.0222009	0.00002	3.1E-05	0.0039463	0.0034	0.00749	0.0287336	5.47466
0.0209822	0.00002	3.1E-05	0.0037037	0.0034	0.00749	0.0276689	5.95755
0.0198345	0.00002	3E-05	0.0034916	0.0034	0.00749	0.0266949	6.43615
0.0200596	0.00002	3E-05	0.0027189	0.0034	0.00749	0.0265029	10.5486
0.0195873	0.00002	3E-05	0.0023354	0.0034	0.00749	0.0259885	13.9963
0.0232599	0.00002	3.1E-05	0.0032916	0.0034	0.00749	0.0292371	8.03612
0.0245948	0.00002	3.1E-05	0.0028736	0.0034	0.00749	0.0301393	10.9155
0.0248541	0.00002	3.1E-05	0.0036337	0.0034	0.00749	0.0308756	6.95298
0.0237681	0.00002	3.1E-05	0.0036179	0.0034	0.00749	0.0297847	6.78992
0.0228465	0.00002	3.1E-05	0.0038023	0.0034	0.00749	0.0291589	5.99815
0.0221315	0.00002	3.1E-05	0.003023	0.0034	0.00749	0.0282277	9.16327
0.0213625	0.00002	3.1E-05	0.0026069	0.0034	0.00749	0.0274588	11.9519
0.0209511	0.00002	3.1E-05	0.0023958	0.0034	0.00749	0.027062	13.9239
0.0250301	0.00002	3.2E-05	0.0039777	0.0034	0.00749	0.0309878	5.86439
0.0213303	0.00002	3.1E-05	0.0025445	0.0034	0.00749	0.0274103	12.5211
0.0221315	0.00002	3.1E-05	0.0027382	0.0034	0.00749	0.0281112	11.1221
0.0210446	0.00002	3.1E-05	0.002474	0.0034	0.00749	0.0271626	13.1105
UTavg/Tavg	Uff	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu
0.214	0.00027	0.000122	4E-04	0.2145	3.23
0.164	0.00026	0.000121	4E-04	0.1647	2.63
0.129	0.00025	0.00012	4E-04	0.129	2.08
0.154	0.00026	0.000121	4E-04	0.154	1.93
0.161	0.00027	0.000122	4E-04	0.161	1.84
0.168	0.00028	0.000123	4E-04	0.1687	1.43
0.168	0.00027	0.000122	4E-04	0.1687	1.7
0.139	0.00027	0.000121	4E-04	0.139	1.4
0.136	0.00026	0.000121	4E-04	0.1363	1.59
0.129	0.00026	0.000121	4E-04	0.129	1.62
0.126	0.00026	0.00012	4E-04	0.1267	1.79
0.114	0.00025	0.00012	4E-04	0.1145	1.67
0.122	0.00025	0.00012	4E-04	0.1223	2.19
0.116	0.00025	0.00012	4E-04	0.1164	1.71
0.112	0.00026	0.00012	4E-04	0.1127	1.36
0.164	0.00026	0.000121	4E-04	0.1647	2.72
0.15	0.00026	0.000121	4E-04	0.1508	2.03
0.15	0.00026	0.000121	4E-04	0.1508	2.19
0.154	0.00026	0.00012	4E-04	0.154	2.57
0.136	0.00026	0.000121	4E-04	0.1363	1.52
Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/ff	Uw/w	Umic/Vmic	UG/G	US/S	URs/Rs	URs
0.0283407	0.00002	3.2E-05	0.0033557	0.0034	0.00749	0.0334467	6.90242
0.0275673	0.00002	3.2E-05	0.0032668	0.0034	0.00749	0.0327576	7.12449
0.0270402	0.00002	3.2E-05	0.0031847	0.0034	0.00749	0.0322829	7.37402
0.027407	0.00002	3.2E-05	0.0037622	0.0034	0.00749	0.032836	5.37928
0.0273012	0.00002	3.2E-05	0.0040486	0.0034	0.00749	0.0328841	4.65084
0.0273012	0.00002	3.2E-05	0.0063291	0.0034	0.00749	0.0342933	1.98461
0.027407	0.00002	3.2E-05	0.0048685	0.0034	0.00749	0.0334126	3.26869
0.0268371	0.00002	3.2E-05	0.004562	0.0034	0.00749	0.0328528	3.65607
0.0267841	0.00002	3.2E-05	0.004065	0.0034	0.00749	0.0324643	4.54852
0.0267335	0.00002	3.2E-05	0.0038168	0.0034	0.00749	0.0323016	5.13293
0.0264831	0.00002	3.2E-05	0.003592	0.0034	0.00749	0.0319908	5.73618
0.0260923	0.00002	3.2E-05	0.003499	0.0034	0.00749	0.0316283	5.97018
0.0263843	0.00002	3.2E-05	0.0030157	0.0034	0.00749	0.0316695	8.05412
0.0260442	0.00002	3.2E-05	0.003465	0.0034	0.00749	0.0315717	6.07644
0.0261405	0.00002	3.2E-05	0.003888	0.0034	0.00749	0.0318471	4.86947
0.0270402	0.00002	3.2E-05	0.0030544	0.0034	0.00749	0.0322325	8.0043
0.0268349	0.00002	3.2E-05	0.0035765	0.0034	0.00749	0.0322758	5.84252
0.0265328	0.00002	3.2E-05	0.0034722	0.0034	0.00749	0.0319791	6.13714
0.0265627	0.00002	3.2E-05	0.0031646	0.0034	0.00749	0.0318927	7.36947
0.0264831	0.00002	3.2E-05	0.0042017	0.0034	0.00749	0.0322865	4.23092
UTavg/Tavg	U/ff	Uw/w	Umic/Vmic	UG/G	US/S	URs/Rs	URs

SUD 1.5		L (m)		0.65000															
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC(C)	dellat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m²/2s)	PR	epsilon	X	N²	Rs	phi	
1	1461	905	0.05172	3.09214	26.4	25.1	1.3	25.75	0.028065	9.883	346.552	1.563E-05	0.0121	0.1027	0.084102	5921.077	62.5073	3.70067	
2	1461	736	0.04247	2.53922	26.2	25.1	1.1	25.55	0.026057	7.879	346.494	1.562E-05	0.00984	0.0835	0.084116	5924.584	41.3524	3.70287	
3	1461	1087	0.05965	3.56659	27	25.3	1.7	26.15	0.028094	10.04	346.783	1.567E-05	0.01453	0.1235	0.084046	5907.083	90.0836	3.69193	
4	1461	734	0.04202	2.51270	26.2	25.2	1	25.7	0.026061	8.485	346.523	1.562E-05	0.00981	0.0833	0.084109	5922.83	41.1227	3.70177	
5	1461	1137	0.06813	4.07351	27.4	25.2	2.2	26.3	0.026105	10.12	346.87	1.568E-05	0.0152	0.1292	0.084025	5901.85	98.5236	3.68866	
6	1461	540	0.03443	2.05863	26.6	25.2	1.4	25.9	0.026076	4.066	346.639	1.564E-05	0.00722	0.0613	0.084081	5915.823	22.2461	3.69739	
7	1461	868	0.04226	2.52654	26.6	25.6	1	26.1	0.02609	8.589	346.754	1.566E-05	0.0116	0.0986	0.084053	5908.83	67.4489	3.69302	
8	1461	1065	0.05294	3.16550	26.9	25.6	1.3	26.25	0.026101	10.34	346.841	1.567E-05	0.01424	0.121	0.084032	5903.593	86.4519	3.68975	
9	1461	998	0.05941	3.55224	27	25.4	1.6	26.2	0.026098	10.58	346.812	1.567E-05	0.01334	0.1134	0.084039	5905.338	75.9283	3.69084	
10	1461	1114	0.06901	4.12636	27.4	25.4	2	26.4	0.026112	11.42	346.928	1.569E-05	0.01489	0.1266	0.084011	5898.365	94.5536	3.68648	
11	1461	562	0.03397	2.03087	26.6	25.8	0.8	26.2	0.026098	6.919	346.812	1.567E-05	0.00751	0.0639	0.084039	5905.338	24.0771	3.69084	
12	1461	640	0.03844	2.29816	26.4	25.4	1	25.9	0.026076	7.094	346.639	1.564E-05	0.00856	0.0727	0.084061	5915.823	31.2483	3.69739	
13	1461	1063	0.05093	3.04512	26.8	25.7	1.1	26.25	0.026101	11.31	346.841	1.567E-05	0.01421	0.1208	0.084032	5903.593	86.1275	3.68975	
14	1461	922	0.05896	3.52552	27.1	25.6	1.5	26.35	0.026108	11.12	346.899	1.568E-05	0.01232	0.1048	0.084018	5900.107	84.7777	3.68757	
15	1461	1163	0.06878	4.11251	28	26	2	27	0.026156	11.32	347.275	1.574E-05	0.01555	0.1323	0.083927	5877.527	102.896	3.67345	
16	1461	611	0.03374	2.01735	26.5	25.4	1.1	25.95	0.026079	4.889	346.668	1.565E-05	0.00817	0.0694	0.084074	5914.073	28.4769	3.6963	
17	1461	708	0.04356	2.60476	26.6	25.6	1	26.1	0.02609	9.108	346.754	1.566E-05	0.00946	0.0804	0.084053	5908.83	38.2216	3.69302	
18	1461	1088	0.05361	3.20528	26.7	25.5	1.2	26.1	0.02609	11.49	346.754	1.566E-05	0.01454	0.1236	0.084053	5908.83	90.261	3.69302	
19	1461	1104	0.07073	4.19291	27.9	25.6	2.3	26.75	0.026138	10.24	347.131	1.572E-05	0.01476	0.1255	0.083962	5886.195	92.7804	3.67887	
20	1461	1002	0.05941	3.55214	26.9	25.4	1.5	26.15	0.026094	11.28	346.783	1.567E-05	0.01339	0.1138	0.084046	5907.083	76.5459	3.69193	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC(C)	dellat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m²/2s)	PR	epsilon	X	N²	Rs	phi	

Ud/Tt	UVR/VR	UVH/VH	Uk/k	UNu/NU	UNu
0.544	0.00033	0.000128	4E-04	0.544	5.36
0.643	0.00035	0.000131	4E-04	0.6429	5.07
0.416	0.00031	0.000126	4E-04	0.4161	4.18
0.707	0.00035	0.000131	4E-04	0.7072	6
0.321	0.00003	0.000125	4E-04	0.3216	3.25
0.505	0.00038	0.000134	4E-04	0.5052	2.05
0.707	0.00035	0.000131	4E-04	0.7072	6.06
0.544	0.00032	0.000128	4E-04	0.544	5.63
0.442	0.00031	0.000126	4E-04	0.4421	4.68
0.354	0.00003	0.000125	4E-04	0.3537	4.04
0.884	0.00039	0.000135	4E-04	0.8839	6.12
0.707	0.00037	0.000132	4E-04	0.7072	5.02
0.643	0.00033	0.000128	4E-04	0.6429	7.27
0.471	0.00031	0.000126	4E-04	0.4715	5.24
0.354	0.00003	0.000125	4E-04	0.3537	4.01
0.643	0.00039	0.000135	4E-04	0.6429	3.19
0.707	0.00035	0.00013	4E-04	0.7072	6.44
0.589	0.00032	0.000127	4E-04	0.5893	6.77
0.307	0.00003	0.000125	4E-04	0.3076	3.15
0.471	0.00031	0.000126	4E-04	0.4715	5.32
Ud/Tt	UVR/VR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	Uiff	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0274602	0.00002	3.2E-05	0.0055249	0.0034	0.00749	0.0336616	2.11659
0.0275673	0.00002	3.2E-05	0.0067935	0.0034	0.00749	0.0348569	1.44142
0.0270402	0.00002	3.2E-05	0.0045998	0.0034	0.00749	0.0329583	2.969
0.0275136	0.00002	3.2E-05	0.006812	0.0034	0.00749	0.034829	1.43226
0.0268859	0.00002	3.2E-05	0.0043975	0.0034	0.00749	0.0327208	3.22377
0.0273012	0.00002	3.2E-05	0.0092593	0.0034	0.00749	0.036861	0.82001
0.027092	0.00002	3.2E-05	0.0057604	0.0034	0.00749	0.0337216	1.93727
0.0269371	0.00002	3.2E-05	0.0046948	0.0034	0.00749	0.0329275	2.84665
0.0269885	0.00002	3.2E-05	0.00501	0.0034	0.00749	0.0331546	2.51731
0.0267841	0.00002	3.2E-05	0.0044883	0.0034	0.00749	0.0326866	3.09064
0.0269885	0.00002	3.2E-05	0.0088968	0.0034	0.00749	0.036269	0.87325
0.0273012	0.00002	3.2E-05	0.0078125	0.0034	0.00749	0.0354956	1.10918
0.0269371	0.00002	3.2E-05	0.0047037	0.0034	0.00749	0.0329326	2.8364
0.0268349	0.00002	3.2E-05	0.005423	0.0034	0.00749	0.0332896	2.15642
0.0261889	0.00002	3.2E-05	0.0042992	0.0034	0.00749	0.0320973	3.30269
0.0272486	0.00002	3.2E-05	0.0081833	0.0034	0.00749	0.0357882	1.01914
0.027092	0.00002	3.2E-05	0.0070621	0.0034	0.00749	0.0346975	1.32619
0.027092	0.00002	3.2E-05	0.0045956	0.0034	0.00749	0.0329985	2.97847
0.0264336	0.00002	3.2E-05	0.004529	0.0034	0.00749	0.0324227	3.00819
0.0270402	0.00002	3.2E-05	0.00489	0.0034	0.00749	0.0331846	2.54015
UTavg/Tavg	Uiff	Uv/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Std	1.75	0.24000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC(C)	deltaT(C)	Tavg (C)	K(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Re	phi
1	383	501	0.13851	8.26906	36.7	24.6	12.1	30.65	0.026422	7.502	349.381	1.61E-05	0.0067	0.21874	0.02187	1508.23	72.17	2.120952
2	383	600	0.14713	8.78367	35.9	24.7	11.2	30.3	0.026396	9.164	349.179	1.61E-05	0.00802	0.26182	0.02188	1511.31	103.6	2.125273
3	383	699	0.15577	9.29853	35	24.6	10.4	29.8	0.02636	11.07	348.892	1.6E-05	0.00934	0.30477	0.0219	1515.71	140.8	2.131471
4	383	801	0.16419	9.80238	34.1	24.5	9.6	29.3	0.026324	13.34	348.604	1.6E-05	0.01071	0.34895	0.02192	1520.14	186.1	2.137698
5	383	900	0.17283	10.31814	34	24.4	9.6	29.2	0.026316	14.78	348.546	1.59E-05	0.01203	0.39201	0.02192	1521.03	233.7	2.138948
6	383	1000	0.18170	10.84775	34.2	24.2	10	29.2	0.026316	16.68	348.546	1.59E-05	0.01337	0.43557	0.02192	1521.03	288.6	2.138948
7	383	1103	0.19057	11.37717	34.5	24.3	10.2	29.4	0.026331	18.91	348.661	1.6E-05	0.01474	0.48059	0.02191	1519.25	350.9	2.136451
8	383	1198	0.19881	11.86910	34	24.3	9.7	29.15	0.026313	19.36	348.517	1.59E-05	0.01601	0.52177	0.02192	1521.47	414.2	2.139573
9	383	1303	0.20749	12.38750	33.9	24.3	9.6	29.1	0.026309	21.31	348.488	1.59E-05	0.01742	0.56746	0.02192	1521.92	490.1	2.140198
10	383	1403	0.21606	12.89925	34	24.5	9.5	29.25	0.02632	23.34	348.575	1.6E-05	0.01875	0.61116	0.02192	1520.59	566	2.138323
11	383	1499	0.22494	13.42950	33.5	24.4	9.1	28.95	0.026298	26.43	348.402	1.59E-05	0.02004	0.65265	0.02193	1523.25	648.8	2.142076
12	383	1597	0.24059	14.36330	34.2	24.4	9.8	29.3	0.026324	28.05	348.604	1.6E-05	0.02135	0.69572	0.02192	1520.14	735.8	2.137698
13	383	1699	0.25020	14.93760	34.8	24.4	10.4	29.6	0.026345	28.57	348.776	1.6E-05	0.02271	0.74053	0.02191	1517.48	832.2	2.133958
14	383	1802	0.25867	15.44270	34.8	24.3	10.5	29.55	0.026342	30.24	348.748	1.6E-05	0.02409	0.78535	0.02191	1517.92	938.2	2.134581
15	383	1895	0.26758	15.97480	34.8	24.4	10.4	29.6	0.026345	32.67	348.776	1.6E-05	0.02533	0.82585	0.02191	1517.48	1036	2.133958
16	383	1997	0.27625	16.49280	34.3	24.2	10.1	29.25	0.026332	35.89	348.575	1.6E-05	0.02669	0.86991	0.02192	1520.59	1161	2.138323
17	383	2096	0.28493	17.01080	34.7	24.2	10.5	29.45	0.026335	38.71	348.69	1.6E-05	0.02802	0.91334	0.02191	1518.81	1267	2.135827
18	383	2205	0.29410	17.55820	35.1	24.2	10.9	29.65	0.026349	37.65	348.805	1.6E-05	0.02948	0.96115	0.0219	1517.04	1401	2.133336
19	383	2298	0.30354	18.12160	35.4	24.2	11.2	29.8	0.02636	39.02	348.892	1.6E-05	0.03072	1.00194	0.0219	1515.71	1622	2.131471
20	383	2397	0.31225	18.64180	35.7	24.2	11.5	29.95	0.026371	40.2	348.978	1.6E-05	0.03204	1.04536	0.02189	1514.39	1655	2.128608

Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu
0.0584	0.00025	0.0001	0.00038	0.05929	0.4448
0.0631	0.00025	0.0001	0.00038	0.06392	0.5852
0.068	0.00025	0.0001	0.00038	0.06872	0.7605
0.0737	0.00025	0.0001	0.00038	0.07433	0.9914
0.0737	0.00024	0.0001	0.00038	0.07433	1.0988
0.0707	0.00024	0.0001	0.00038	0.07142	1.1201
0.0693	0.00024	0.0001	0.00038	0.07004	1.1841
0.0729	0.00024	0.0001	0.00038	0.07358	1.4246
0.0737	0.00024	0.0001	0.00038	0.07433	1.5842
0.0744	0.00024	0.0001	0.00038	0.0751	1.7531
0.0777	0.00024	0.0001	0.00038	0.07835	2.0711
0.0722	0.00023	0.0001	0.00038	0.07284	2.0434
0.068	0.00023	0.0001	0.00038	0.06872	1.9631
0.0673	0.00023	0.0001	0.00038	0.06808	2.0591
0.068	0.00023	0.0001	0.00038	0.06872	2.2452
0.07	0.00023	0.0001	0.00038	0.07072	2.5384
0.0673	0.00023	0.0001	0.00038	0.06808	2.4992
0.0649	0.00023	0.0001	0.00038	0.06564	2.4715
0.0631	0.00023	0.0001	0.00038	0.06392	2.4941
0.0615	0.00023	0.0001	0.00038	0.0623	2.5041
Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lf	Uwv	Umic/Vmic	UG/G	US/S	URs/Rs	URs
0.02307015	0.00002	3.1E-05	0.00998	0.0034	0.0074867	0.03466	2.50108
0.023333663	0.00002	3.1E-05	0.0083333	0.0034	0.0074867	0.03306	3.42473
0.02372819	0.00002	3.1E-05	0.0071531	0.0034	0.0074867	0.03222	4.53607
0.02413311	0.00002	3.1E-05	0.0062422	0.0034	0.0074867	0.03176	5.8789
0.02421575	0.00002	3.1E-05	0.0055556	0.0034	0.0074867	0.03131	7.31852
0.02421575	0.00002	3.1E-05	0.005	0.0034	0.0074867	0.03093	8.92846
0.02405102	0.00002	3.1E-05	0.0045331	0.0034	0.0074867	0.03051	10.7074
0.02425729	0.00002	3.1E-05	0.0041736	0.0034	0.0074867	0.03047	12.6219
0.02429897	0.00002	3.1E-05	0.0038373	0.0034	0.0074867	0.03033	14.8628
0.02417436	0.00002	3.1E-05	0.0035638	0.0034	0.0074867	0.03009	17.0922
0.02442487	0.00002	3.1E-05	0.0033356	0.0034	0.0074867	0.03019	19.5894
0.02413311	0.00002	3.1E-05	0.0031309	0.0034	0.0074867	0.02987	21.9763
0.02388851	0.00002	3.1E-05	0.0029429	0.0034	0.0074867	0.02959	24.626
0.02392893	0.00002	3.1E-05	0.0027747	0.0034	0.0074867	0.02956	27.6756
0.02388851	0.00002	3.1E-05	0.0026385	0.0034	0.0074867	0.02948	30.5165
0.02417436	0.00002	3.1E-05	0.0025038	0.0034	0.0074867	0.02966	34.1335
0.02401019	0.00002	3.1E-05	0.0023855	0.0034	0.0074867	0.02949	37.3636
0.02384823	0.00002	3.1E-05	0.0022676	0.0034	0.0074867	0.02932	41.0928
0.02372819	0.00002	3.1E-05	0.0021759	0.0034	0.0074867	0.0292	44.4244
0.02360935	0.00002	3.1E-05	0.0020859	0.0034	0.0074867	0.02907	48.113
UTavg/Tavg	U/lf	Uwv	Umic/Vmic	UG/G	US/S	URs/Rs	URs

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.1386	0.00027	0.0001	0.00038	0.13901	1.404
0.1219	0.00026	0.0001	0.00038	0.12232	1.4711
0.1159	0.00025	0.0001	0.00038	0.11635	1.737
0.1105	0.00025	0.0001	0.00038	0.11094	1.9981
0.1025	0.00024	0.0001	0.00038	0.10297	2.1271
0.0996	0.00024	0.0001	0.00038	0.10009	2.4245
0.0907	0.00024	0.0001	0.00038	0.09121	2.3917
0.0769	0.00024	0.0001	0.00038	0.07751	2.0181
0.0737	0.00023	0.0001	0.00038	0.07433	2.1504
0.0655	0.00023	0.0001	0.00038	0.06623	1.9549
0.0667	0.00023	0.0001	0.00038	0.06746	2.3082
0.0693	0.00023	0.0001	0.00038	0.07004	2.4907
0.0969	0.00024	0.0001	0.00038	0.09738	3.2072
0.1025	0.00024	0.0001	0.00038	0.10297	3.3103
0.1055	0.00024	0.0001	0.00038	0.10601	2.9774
0.1122	0.00024	0.0001	0.00038	0.11268	3.3667
0.1684	0.00026	0.0001	0.00038	0.16865	3.2496
0.1537	0.00025	0.0001	0.00038	0.15404	3.4677
0.1607	0.00025	0.0001	0.00038	0.16102	3.3815
0.1725	0.00025	0.0001	0.00038	0.17275	4.5831
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lf	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.02566606	0.00002	3.1E-05	0.0054885	0.0034	0.0074867	0.0324	4.41468
0.02555357	0.00002	3.1E-05	0.0047939	0.0034	0.0074867	0.03162	5.64193
0.02503009	0.00002	3.1E-05	0.0042589	0.0034	0.0074867	0.03114	7.03346
0.02489789	0.00002	3.1E-05	0.0038285	0.0034	0.0074867	0.03081	8.60809
0.02450953	0.00002	3.1E-05	0.00334	0.0034	0.0074867	0.03026	11.0978
0.02442487	0.00002	3.1E-05	0.002849	0.0034	0.0074867	0.02999	15.1125
0.02396949	0.00002	3.1E-05	0.0027579	0.0034	0.0074867	0.02959	15.8884
0.02333663	0.00002	3.1E-05	0.0026983	0.0034	0.0074867	0.02905	16.2655
0.02318361	0.00002	3.1E-05	0.0024498	0.0034	0.0074867	0.02884	19.58
0.02266346	0.00002	3.1E-05	0.0024498	0.0034	0.0074867	0.02843	19.2633
0.02266346	0.00002	3.1E-05	0.0021124	0.0034	0.0074867	0.02832	25.8096
0.02266346	0.00002	3.1E-05	0.0019732	0.0034	0.0074867	0.02828	29.538
0.02376807	0.00002	3.1E-05	0.0021673	0.0034	0.0074867	0.02923	25.3962
0.02376807	0.00002	3.1E-05	0.0022183	0.0034	0.0074867	0.02924	24.2554
0.02376807	0.00002	3.1E-05	0.002451	0.0034	0.0074867	0.02932	19.9187
0.02384623	0.00002	3.1E-05	0.0023685	0.0034	0.0074867	0.02935	21.3624
0.02463763	0.00002	3.1E-05	0.0037707	0.0034	0.0074867	0.03057	8.79829
0.02472378	0.00002	3.1E-05	0.0028969	0.0034	0.0074867	0.03025	14.7581
0.02489789	0.00002	3.1E-05	0.0030414	0.0034	0.0074867	0.03045	13.484
0.02485413	0.00002	3.1E-05	0.0026511	0.0034	0.0074867	0.03027	17.6375
UTavg/Tavg	U/lf	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

SUD		L (m)		0.60000														
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	n ²	Rs	phi
1	723	1300	0.10447	6.23637	29.3	26.3	3	27.8	0.026214	17.35	347.738	1.58E-05	0.01738	0.29926	0.04148	2894.94	259.3	4.071003
2	723	1018	0.10447	6.23626	30.7	26.3	4.4	28.5	0.026265	11.81	348.142	1.59E-05	0.01361	0.23462	0.04143	2883.07	168.7	4.054322
3	723	1274	0.12088	7.21591	30.6	26.5	4.1	28.55	0.026289	16.86	348.171	1.59E-05	0.01703	0.29364	0.04143	2882.23	248.5	4.053134
4	723	1280	0.13043	7.78585	30.9	26.4	4.5	28.65	0.026276	17.98	348.229	1.59E-05	0.01724	0.29738	0.04142	2880.54	254.7	4.050762
5	723	1455	0.14684	8.76550	31.5	26.4	5.1	28.95	0.026298	20.1	348.402	1.59E-05	0.01945	0.33559	0.0414	2875.49	323.8	4.043657
6	723	1780	0.16437	9.81204	32	26.4	5.6	29.2	0.026316	22.92	348.546	1.59E-05	0.02379	0.41071	0.04138	2871.29	484.3	4.037752
7	723	1860	0.18280	10.91234	32.9	26.5	6.4	29.7	0.026353	24.77	348.834	1.6E-05	0.02486	0.42953	0.04135	2862.92	528.2	4.025985
8	723	2069	0.19919	11.89073	33.4	26.6	6.8	30	0.026375	27.66	349.007	1.6E-05	0.02766	0.47803	0.04133	2857.92	653.1	4.018952
9	723	2143	0.21651	12.92445	34.2	26.6	7.6	30.4	0.026404	28.2	349.237	1.61E-05	0.02865	0.49545	0.0413	2851.27	699.9	4.009606
10	723	2311	0.23496	14.02590	35.2	26.7	8.5	30.95	0.026444	30.7	349.553	1.61E-05	0.03089	0.53478	0.04126	2842.18	812.8	3.996813
11	723	1024	0.08671	5.17640	29.5	26.4	3.1	27.95	0.026225	11.68	347.825	1.58E-05	0.01369	0.23579	0.04147	2892.39	160.8	4.067419
12	723	1149	0.09512	5.67808	29.7	26.6	3.1	28.15	0.02624	13.9	347.94	1.58E-05	0.01536	0.26466	0.04145	2888.99	202.4	4.062648
13	723	1364	0.10378	6.19521	29.3	26.6	2.7	27.95	0.026225	18.02	347.825	1.58E-05	0.01823	0.31408	0.04147	2892.39	286.3	4.067419
14	723	1494	0.11289	6.73890	29.6	26.6	3	28.1	0.026236	20.24	347.911	1.58E-05	0.01997	0.3441	0.04146	2889.84	342.2	4.06384
15	723	1687	0.12154	7.25550	29.9	26.6	3.3	28.25	0.026247	21.32	347.998	1.59E-05	0.02255	0.38864	0.04145	2887.3	436.1	4.060266
16	723	1818	0.12995	7.75708	30.2	26.7	3.5	28.45	0.026262	22.87	348.113	1.59E-05	0.0243	0.41896	0.04143	2883.92	506.2	4.055509
17	723	1967	0.13864	8.27578	30.4	26.7	3.7	28.55	0.026269	24.72	348.171	1.59E-05	0.02629	0.45337	0.04143	2882.23	592.4	4.053134
18	723	2057	0.14729	8.79259	30.6	26.7	3.9	28.65	0.026276	26.47	348.229	1.59E-05	0.0275	0.4742	0.04142	2880.54	647.7	4.050762
19	723	2076	0.15682	9.34951	31	26.8	4.2	28.9	0.026285	27.77	348.373	1.59E-05	0.02775	0.47878	0.0414	2876.33	659.3	4.04484
20	723	2126	0.16459	9.82537	31.4	26.9	4.5	29.15	0.026313	28.6	348.517	1.59E-05	0.02842	0.49051	0.04138	2872.13	691	4.038932
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m ² /s)	PR	epsilon	X	n ²	Rs	phi

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.2357	0.00027	0.0001	0.00038	0.23591	4.0929
0.1607	0.00027	0.0001	0.00038	0.16102	1.9009
0.1725	0.00026	0.0001	0.00038	0.17275	2.9299
0.1571	0.00026	0.0001	0.00038	0.15745	2.8318
0.1386	0.00025	0.0001	0.00038	0.13901	2.7937
0.1263	0.00025	0.0001	0.00038	0.12666	2.9029
0.1105	0.00024	0.0001	0.00038	0.11094	2.7478
0.104	0.00024	0.0001	0.00038	0.10447	2.8892
0.093	0.00024	0.0001	0.00038	0.09358	2.7327
0.0832	0.00024	0.0001	0.00038	0.08379	2.5727
0.2281	0.00028	0.0001	0.00038	0.22832	2.6399
0.2281	0.00027	0.0001	0.00038	0.22832	3.1746
0.2619	0.00027	0.0001	0.00038	0.26208	4.9835
0.2357	0.00026	0.0001	0.00038	0.23591	4.7751
0.2143	0.00026	0.0001	0.00038	0.21451	4.5735
0.202	0.00026	0.0001	0.00038	0.20228	4.6454
0.1911	0.00025	0.0001	0.00038	0.19137	4.7306
0.1813	0.00025	0.0001	0.00038	0.18158	4.8057
0.1684	0.00025	0.0001	0.00038	0.16865	4.6831
0.1571	0.00025	0.0001	0.00038	0.15745	4.5034
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	Ulf	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.02543525	0.00002	3.2E-05	0.0038462	0.0034	0.0074867	0.03125	8.10219
0.02481053	0.00002	3.1E-05	0.0049116	0.0034	0.0074867	0.03134	4.97453
0.02476708	0.00002	3.1E-05	0.0039246	0.0034	0.0074867	0.03075	7.64181
0.02468063	0.00002	3.1E-05	0.003876	0.0034	0.0074867	0.03065	7.80893
0.02442467	0.00002	3.1E-05	0.0034364	0.0034	0.0074867	0.03024	9.79159
0.02421575	0.00002	3.1E-05	0.002809	0.0034	0.0074867	0.02981	14.4366
0.02380808	0.00002	3.1E-05	0.0026862	0.0034	0.0074867	0.02943	15.5452
0.02357	0.00002	3.1E-05	0.0024166	0.0034	0.0074867	0.02914	19.0328
0.02325987	0.00002	3.1E-05	0.0023332	0.0034	0.0074867	0.02887	20.2037
0.02284653	0.00002	3.1E-05	0.0021636	0.0034	0.0074867	0.02848	23.1497
0.02529875	0.00002	3.2E-05	0.0048828	0.0034	0.0074867	0.03171	5.09991
0.02511901	0.00002	3.2E-05	0.0043516	0.0034	0.0074867	0.03126	6.32556
0.02529875	0.00002	3.2E-05	0.0036657	0.0034	0.0074867	0.03105	8.85962
0.0251637	0.00002	3.2E-05	0.0033467	0.0034	0.0074867	0.0308	10.5376
0.02503009	0.00002	3.2E-05	0.0029638	0.0034	0.0074867	0.03053	13.3145
0.02485413	0.00002	3.1E-05	0.0027503	0.0034	0.0074867	0.03031	15.3411
0.02476708	0.00002	3.1E-05	0.0025419	0.0034	0.0074867	0.03016	17.8687
0.02468063	0.00002	3.1E-05	0.0024307	0.0034	0.0074867	0.03005	19.4665
0.02446713	0.00002	3.1E-05	0.0024085	0.0034	0.0074867	0.02987	19.695
0.02425729	0.00002	3.1E-05	0.0023518	0.0034	0.0074867	0.02968	20.5109
UTavg/Tavg	Ulf	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Sid	1.75	L (m)																	0.65000
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC)	deltaT(C)	Tavg (C)	kW/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Rs	phi	
1	925	862	0.07806	4.65969	29.8	26.4	3.4	28.1	0.026236	8.639	347.911	1.58E-05	0.01152	0.15518	0.05304	3697.24	89.03	5.199242	
2	925	586	0.06918	4.12944	29.8	26.5	3.3	28.15	0.02624	6.908	347.94	1.59E-05	0.00783	0.1055	0.05303	3696.15	41.14	5.197717	
3	925	950	0.08669	5.17503	30.6	26.8	3.8	28.7	0.02628	8.408	348.258	1.58E-05	0.0127	0.17119	0.05299	3684.26	108	5.180993	
4	925	1268	0.09514	5.67945	30.5	26.9	3.6	28.7	0.02628	11.86	348.258	1.58E-05	0.01682	0.22669	0.05299	3684.26	189.3	5.180993	
5	925	1413	0.10423	6.22219	30.4	26.7	3.7	28.55	0.026269	13.87	348.171	1.59E-05	0.01889	0.25456	0.053	3687.5	239	5.185545	
6	925	1189	0.11288	6.73859	31.4	26.3	5.1	28.85	0.026291	11.88	348.344	1.59E-05	0.01589	0.21431	0.05297	3681.03	189.1	5.176447	
7	925	1335	0.12110	7.22873	31.8	26.2	5.6	29	0.026302	12.45	348.431	1.59E-05	0.01785	0.24069	0.05296	3677.8	213.1	5.171905	
8	925	1466	0.13014	7.76842	31.7	26.1	5.6	28.9	0.026295	14.38	348.373	1.59E-05	0.01896	0.26787	0.05297	3679.95	264	5.174933	
9	925	1552	0.13845	8.26455	31.8	26.2	5.6	29	0.026302	16.27	348.431	1.59E-05	0.02075	0.27981	0.05296	3677.8	288	5.171905	
10	925	1691	0.14728	8.79154	32	26.2	5.8	29.1	0.026309	17.77	348.488	1.59E-05	0.0226	0.30492	0.05295	3675.65	341.8	5.168885	
11	925	1772	0.15594	9.30856	31.9	26.2	5.7	29.05	0.026305	20.27	348.459	1.59E-05	0.02369	0.3195	0.05296	3676.73	375.3	5.170396	
12	925	1695	0.16436	9.81130	32.8	26.3	6.5	29.55	0.026342	19.72	348.748	1.6E-05	0.02266	0.30587	0.05291	3666	343	5.155319	
13	925	1850	0.17393	10.38251	32.9	26.3	6.6	29.6	0.026345	21.76	348.776	1.6E-05	0.02473	0.33387	0.05291	3664.94	408.5	5.153816	
14	925	1951	0.18257	10.89830	33.2	26.3	6.9	29.75	0.026356	22.81	348.863	1.6E-05	0.02608	0.35218	0.05289	3661.73	484.2	5.149309	
15	925	2115	0.19122	11.41470	33.4	26.3	7.1	29.85	0.026364	24.42	348.92	1.6E-05	0.02827	0.38185	0.05289	3659.6	533.8	5.146308	
16	925	641	0.09968	5.95010	32.5	26.1	6.4	29.3	0.026324	7.372	348.604	1.6E-05	0.00857	0.11562	0.05293	3671.36	48.08	5.162849	
17	925	1020	0.10864	6.48511	31.8	26.1	5.7	28.95	0.026298	9.843	348.402	1.59E-05	0.01363	0.18388	0.05296	3678.88	124.4	5.17342	
18	925	1249	0.11630	6.94249	31.8	26.1	5.7	28.95	0.026298	11.28	348.402	1.59E-05	0.0167	0.22516	0.05296	3678.88	188.6	5.17342	
19	925	1402	0.12568	7.48626	31.5	26.1	5.4	28.8	0.026287	13.89	348.315	1.59E-05	0.01874	0.25268	0.05298	3682.11	235.1	5.177965	
20	925	1795	0.13914	8.30571	30.8	26.2	4.6	28.5	0.026265	20.03	348.142	1.59E-05	0.02399	0.32335	0.053	3686.58	386.7	5.187064	
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC)	deltaT(C)	Tavg (C)	kW/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Rs	phi	

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.208	0.00029	0.0001	0.00038	0.20821	1.7779
0.2143	0.0003	0.0001	0.00038	0.21451	1.4819
0.1861	0.00028	0.0001	0.00038	0.18635	1.7531
0.1964	0.00027	0.0001	0.00038	0.19667	2.3523
0.1911	0.00027	0.0001	0.00038	0.19137	2.6742
0.1386	0.00026	0.0001	0.00038	0.13901	1.6515
0.1263	0.00026	0.0001	0.00038	0.12666	1.5764
0.1263	0.00026	0.0001	0.00038	0.12666	1.8211
0.1263	0.00025	0.0001	0.00038	0.12666	2.0606
0.1219	0.00025	0.0001	0.00038	0.12232	2.1736
0.1241	0.00025	0.0001	0.00038	0.12446	2.5231
0.1088	0.00025	0.0001	0.00038	0.10924	2.1546
0.1071	0.00024	0.0001	0.00038	0.1076	2.3402
0.1025	0.00024	0.0001	0.00038	0.10297	2.3591
0.0896	0.00024	0.0001	0.00038	0.10009	2.4443
0.1105	0.00027	0.0001	0.00038	0.11094	0.8179
0.1241	0.00027	0.0001	0.00038	0.12446	1.225
0.1241	0.00026	0.0001	0.00038	0.12446	1.4039
0.1309	0.00026	0.0001	0.00038	0.13133	1.8238
0.1537	0.00025	0.0001	0.00038	0.15404	3.0855
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lif	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0251637	0.00002	3.2E-05	0.0058005	0.0034	0.0074867	0.03222	2.86874
0.02511901	0.00002	3.2E-05	0.0085324	0.0034	0.0074867	0.03453	1.42076
0.02463763	0.00002	3.1E-05	0.0052632	0.0034	0.0074867	0.03144	3.39429
0.02463763	0.00002	3.1E-05	0.0039746	0.0034	0.0074867	0.03067	5.80685
0.02476708	0.00002	3.1E-05	0.0035386	0.0034	0.0074867	0.03056	7.30256
0.02450953	0.00002	3.1E-05	0.0042052	0.0034	0.0074867	0.03069	5.18879
0.02438276	0.00002	3.1E-05	0.0037453	0.0034	0.0074867	0.03035	6.46613
0.02446713	0.00002	3.1E-05	0.0033647	0.0034	0.0074867	0.03024	7.98443
0.02438276	0.00002	3.1E-05	0.0032216	0.0034	0.0074867	0.03011	8.66957
0.02429897	0.00002	3.1E-05	0.0029568	0.0034	0.0074867	0.02993	10.229
0.02434079	0.00002	3.1E-05	0.0028217	0.0034	0.0074867	0.02991	11.227
0.02392893	0.00002	3.1E-05	0.0029499	0.0034	0.0074867	0.02963	10.162
0.02388851	0.00002	3.1E-05	0.0027027	0.0034	0.0074867	0.0295	12.052
0.02376807	0.00002	3.1E-05	0.0025628	0.0034	0.0074867	0.02935	13.3317
0.02368844	0.00002	3.1E-05	0.0023641	0.0034	0.0074867	0.02922	15.5932
0.02413311	0.00002	3.1E-05	0.0078003	0.0034	0.0074867	0.03311	1.62507
0.02442487	0.00002	3.1E-05	0.004902	0.0034	0.0074867	0.03103	3.86042
0.02442487	0.00002	3.1E-05	0.0040032	0.0034	0.0074867	0.03051	5.69139
0.02455208	0.00002	3.1E-05	0.0035663	0.0034	0.0074867	0.0304	7.14689
0.02481053	0.00002	3.1E-05	0.0027855	0.0034	0.0074867	0.03028	11.6791
UTavg/Tavg	U/lif	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

S/d	1.75	0.65000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC)	deltaT(C)	Tavg (C)	K(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	V^2	Re	phi
1	1202	420	0.06988	4.17140	29.8	26	3.8	27.9	0.026222	6.128	347.796	1.58E-05	0.00561	0.05817	0.06895	4810.05	16.27	6.76414
2	1202	822	0.08761	5.22984	30.3	26	4.3	28.15	0.02624	8.604	347.94	1.59E-05	0.01089	0.11389	0.06892	4803	62.3	6.754223
3	1202	920	0.08534	5.69152	30.7	26	4.7	28.35	0.026254	9.209	348.056	1.59E-05	0.0123	0.12751	0.06889	4797.37	77.89	6.746307
4	1202	1009	0.10424	6.22230	31.3	26	5.3	28.65	0.026276	9.763	348.229	1.59E-05	0.01349	0.13991	0.06886	4788.95	93.74	6.734461
5	1202	1122	0.11243	6.71160	31.7	26.1	5.6	28.9	0.026295	10.73	348.373	1.59E-05	0.015	0.15564	0.06883	4781.95	116.8	6.724616
6	1202	1237	0.12134	7.24321	32.2	26	6.2	29.1	0.026309	11.28	348.488	1.59E-05	0.01654	0.17165	0.06881	4776.36	140.7	6.716757
7	1202	1358	0.12973	7.74438	32.6	26	6.6	29.3	0.026324	12.11	348.604	1.6E-05	0.01815	0.18851	0.06879	4770.78	169.6	6.708913
8	1202	1471	0.13886	8.28891	33	26	7	29.5	0.026338	13.07	348.719	1.6E-05	0.01966	0.20426	0.06876	4765.21	188.8	6.701084
9	1202	1525	0.14744	8.80131	33.6	26	7.6	29.8	0.02636	13.66	348.892	1.6E-05	0.02039	0.21186	0.06873	4756.88	213.6	6.688368
10	1202	1626	0.15622	9.32526	33.8	26	7.8	29.9	0.026367	14.83	348.949	1.6E-05	0.02174	0.22593	0.06872	4754.11	242.7	6.685471
11	1202	631	0.07351	4.38784	29.7	26	3.7	27.85	0.026218	6.983	347.767	1.58E-05	0.00843	0.08738	0.06895	4811.47	36.74	6.766126
12	1202	782	0.08215	4.90402	30.2	26	4.2	28.1	0.026236	7.656	347.911	1.58E-05	0.01045	0.10834	0.06892	4804.41	56.39	6.756205
13	1202	946	0.09034	5.39280	30.8	26.1	4.7	28.45	0.026262	8.286	348.113	1.59E-05	0.01265	0.13113	0.06888	4794.56	82.44	6.742355
14	1202	1110	0.09922	5.92284	30.9	26	4.9	28.45	0.026262	9.583	348.113	1.59E-05	0.01484	0.15386	0.06888	4794.56	113.6	6.742355
15	1202	1254	0.10756	6.42054	30.8	25.9	4.9	28.35	0.026254	11.24	348.056	1.59E-05	0.01676	0.1738	0.06889	4797.37	144.8	6.748307
16	1202	1394	0.11675	6.96958	31.2	25.9	5.3	28.55	0.026269	12.24	348.171	1.59E-05	0.01863	0.19326	0.06887	4791.75	178	6.738406
17	1202	1530	0.12494	7.46794	31.4	25.9	5.5	28.65	0.026276	13.6	348.229	1.59E-05	0.02045	0.21215	0.06886	4788.95	216.6	6.734461
18	1202	956	0.09261	5.52835	30.6	26	4.6	28.3	0.026251	8.879	348.027	1.59E-05	0.01278	0.13248	0.06889	4798.78	84.23	6.748285
19	1202	1090	0.10097	6.02721	31.2	26.1	5.1	28.65	0.026276	9.61	348.229	1.59E-05	0.01457	0.15114	0.06886	4788.95	109.4	6.734461
20	1202	1276	0.11407	6.80904	31.5	26	5.5	28.75	0.026284	11.26	348.286	1.59E-05	0.01706	0.17696	0.06885	4786.15	149.9	6.730522

Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu
0.1861	0.0003	0.0001	0.00038	0.18635	1.1416
0.1844	0.00028	0.0001	0.00038	0.16475	1.401
0.1504	0.00027	0.0001	0.00038	0.15078	1.3886
0.1334	0.00027	0.0001	0.00038	0.13379	1.3049
0.1263	0.00026	0.0001	0.00038	0.12666	1.3593
0.114	0.00026	0.0001	0.00038	0.11449	1.2918
0.1071	0.00026	0.0001	0.00038	0.1076	1.3031
0.101	0.00025	0.0001	0.00038	0.10151	1.3271
0.093	0.00025	0.0001	0.00038	0.09358	1.2693
0.0907	0.00025	0.0001	0.00038	0.09121	1.3529
0.1911	0.00029	0.0001	0.00038	0.19137	1.3324
0.1684	0.00028	0.0001	0.00038	0.16865	1.2913
0.1504	0.00028	0.0001	0.00038	0.15078	1.2463
0.1443	0.00027	0.0001	0.00038	0.14465	1.3834
0.1443	0.00027	0.0001	0.00038	0.14465	1.6261
0.1334	0.00026	0.0001	0.00038	0.13379	1.6375
0.1286	0.00026	0.0001	0.00038	0.12895	1.7411
0.1537	0.00027	0.0001	0.00038	0.15404	1.3678
0.1386	0.00027	0.0001	0.00038	0.13901	1.3219
0.1286	0.00026	0.0001	0.00038	0.12895	1.4509
Ud/T	UVRVR	UVHVR	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lf	Uw/v	Umic/Vmic	UG/G	US/S	URs/Rs	URs
0.02534409	0.00002	3.2E-05	0.0119048	0.0034	0.0074867	0.03847	0.62599
0.02511901	0.00002	3.2E-05	0.0060827	0.0034	0.0074867	0.03239	2.01802
0.02494418	0.00002	3.2E-05	0.0054348	0.0034	0.0074867	0.03179	2.47955
0.02468063	0.00002	3.1E-05	0.0049554	0.0034	0.0074867	0.03127	2.93134
0.02446713	0.00002	3.1E-05	0.0044563	0.0034	0.0074867	0.0308	3.56773
0.02429897	0.00002	3.1E-05	0.004042	0.0034	0.0074867	0.03043	4.28314
0.02413311	0.00002	3.1E-05	0.0036619	0.0034	0.0074867	0.03012	5.1058
0.02396949	0.00002	3.1E-05	0.003399	0.0034	0.0074867	0.02985	5.93518
0.02372819	0.00002	3.1E-05	0.0032787	0.0034	0.0074867	0.02961	6.32122
0.02364883	0.00002	3.1E-05	0.003075	0.0034	0.0074867	0.02945	7.14771
0.02538959	0.00002	3.2E-05	0.0079239	0.0034	0.0074867	0.03415	1.25457
0.0251637	0.00002	3.2E-05	0.0063939	0.0034	0.0074867	0.03267	1.84204
0.02485413	0.00002	3.1E-05	0.0052654	0.0034	0.0074867	0.03162	2.60701
0.02485413	0.00002	3.1E-05	0.0045045	0.0034	0.0074867	0.03113	3.53396
0.02494418	0.00002	3.2E-05	0.0039872	0.0034	0.0074867	0.03092	4.48067
0.02476708	0.00002	3.1E-05	0.0035668	0.0034	0.0074867	0.03058	5.4736
0.02468063	0.00002	3.1E-05	0.003268	0.0034	0.0074867	0.03037	6.54601
0.02498587	0.00002	3.2E-05	0.0052301	0.0034	0.0074867	0.03169	2.66508
0.02468063	0.00002	3.1E-05	0.0045872	0.0034	0.0074867	0.03104	3.39619
0.02459478	0.00002	3.1E-05	0.0039185	0.0034	0.0074867	0.03061	4.58738
UTavg/Tavg	U/lf	Uw/v	Umic/Vmic	UG/G	US/S	URs/Rs	URs

SUD	2	0.24000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltat(C)	Tavg (C)	k(V/mk)	Nu	c (m/s)	v (m²/s)	PR	epsilon	X	W²	Rs	phi
1	383	456	0.13892	8.29374	35.3	24.4	10.9	29.85	0.0263637	8.38633	348.92	1.6E-05	0.0061	0.198834	0.021898	1515.271	59.906	3.789177
2	383	553	0.14689	8.76981	35.2	24.6	10.6	29.9	0.0263673	9.65228	348.949	1.6E-05	0.0074	0.24115	0.021896	1514.829	88.092	3.787074
3	383	655	0.15578	9.30000	35.1	24.8	10.3	29.95	0.026371	11.1693	348.978	1.6E-05	0.0088	0.285653	0.021894	1514.388	123.57	3.785971
4	383	751	0.16487	9.84270	34.7	24.8	9.9	29.75	0.0263664	13.0235	348.863	1.6E-05	0.01	0.327412	0.021901	1516.154	162.53	3.790386
5	383	851	0.17311	10.33480	34.5	24.8	9.7	29.65	0.0263491	14.6584	348.805	1.6E-05	0.0114	0.370947	0.021905	1517.039	208.75	3.792597
6	383	998	0.18282	10.90250	34.3	24.8	9.5	29.55	0.0263418	16.6811	348.748	1.6E-05	0.0133	0.434952	0.021908	1517.924	287.17	3.794811
7	383	1053	0.19035	11.36420	34	24.7	9.3	29.35	0.0263273	18.6016	348.632	1.6E-05	0.0141	0.485771	0.021916	1519.697	318.85	3.799243
8	383	1141	0.19900	11.88050	34.2	24.8	9.4	29.5	0.0263382	19.8976	348.719	1.6E-05	0.0153	0.497234	0.02191	1518.367	375.4	3.795918
9	383	1253	0.20810	12.42390	34.8	24.9	9.9	29.85	0.0263637	20.7442	348.92	1.6E-05	0.0167	0.546358	0.021898	1515.271	452.32	3.788177
10	383	1350	0.21608	12.90030	34.9	25	9.9	29.95	0.026371	22.3594	348.978	1.6E-05	0.018	0.588751	0.021894	1514.388	524.93	3.785971
11	383	1460	0.22475	13.41790	34.7	24.9	9.8	29.8	0.02636	24.4466	348.892	1.6E-05	0.0195	0.636566	0.021899	1515.713	614.19	3.789282
12	383	1540	0.23316	13.91980	35.5	25	10.5	30.25	0.0263928	24.6252	349.151	1.6E-05	0.0206	0.671945	0.021883	1511.745	682.67	3.779363
13	383	1648	0.24204	14.45010	35	25	10	30	0.0263746	27.7701	349.007	1.6E-05	0.022	0.718772	0.021892	1513.947	782.15	3.784868
14	383	1758	0.25115	14.99400	35	25	10	30	0.0263746	28.9	349.007	1.6E-05	0.0235	0.768748	0.021892	1513.947	890.05	3.784868
15	383	1840	0.25980	15.51060	35.1	25	10.1	30.05	0.0263782	31.6746	349.035	1.6E-05	0.0246	0.802578	0.02189	1513.506	974.9	3.783766
16	383	1992	0.26821	16.01250	35	25	10	30	0.0263746	34.1	349.007	1.6E-05	0.0266	0.868806	0.021892	1513.947	1142.8	3.784868
17	383	2040	0.27588	16.47030	34.9	24.9	10	29.9	0.0263673	36.0876	348.949	1.6E-05	0.0273	0.889595	0.021896	1514.829	1188.8	3.787074
18	383	2088	0.28601	17.07510	35	25	10	30	0.0263746	38.7789	349.007	1.6E-05	0.0279	0.910677	0.021892	1513.947	1255.6	3.784868
19	383	2150	0.29558	17.64630	35.3	25	10.3	30.15	0.0263855	40.1907	349.093	1.6E-05	0.0287	0.93795	0.021887	1512.625	1330.7	3.781563
20	383	2246	0.30249	18.05890	35.8	25	10.8	30.4	0.0264037	40.1188	349.237	1.61E-05	0.03	0.980234	0.021878	1510.426	1451.3	3.776066

Ud/Tt	UVRVR	UVHVR	Uk/k	UNu/NU	UNu
0.0649	0.000253	0.0001	4E-04	0.0656	0.5511
0.0667	0.000251	0.0001	4E-04	0.0675	0.6511
0.0687	0.000249	0.0001	4E-04	0.0694	0.7749
0.0714	0.000246	0.0001	4E-04	0.0721	0.9393
0.0729	0.000245	0.0001	4E-04	0.0736	1.0786
0.0744	0.000243	0.0001	4E-04	0.0751	1.2513
0.076	0.000242	0.0001	4E-04	0.0767	1.4189
0.0752	0.00024	0.0001	4E-04	0.0759	1.5176
0.0714	0.000239	0.0001	4E-04	0.0721	1.4961
0.0714	0.000238	0.0001	4E-04	0.0721	1.6126
0.0722	0.000237	0.0001	4E-04	0.0728	1.7808
0.0673	0.000236	0.0001	4E-04	0.0681	1.6698
0.0707	0.000235	0.0001	4E-04	0.0714	1.9832
0.0707	0.000234	0.0001	4E-04	0.0714	2.1353
0.07	0.000233	0.0001	4E-04	0.0707	2.2401
0.0707	0.000232	0.0001	4E-04	0.0714	2.4353
0.0707	0.000232	0.0001	4E-04	0.0714	2.5772
0.0707	0.000231	0.0001	4E-04	0.0714	2.7692
0.0687	0.00023	0.0001	4E-04	0.0694	2.7863
0.0655	0.00023	0.0001	4E-04	0.0652	2.657
Ud/Tt	UVRVR	UVHVR	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lif	Uw/v	Umic/Vmic	UG/G	US/S	URs/Rs	URs
0.0236884	0.00002	3E-05	0.0109649	0.0034	0.0075	0.0352	2.1703
0.0236488	0.00002	3E-05	0.0090416	0.0034	0.0075	0.034	2.9961
0.0236093	0.00002	3E-05	0.0076336	0.0034	0.0075	0.0326	4.0249
0.0237681	0.00002	3E-05	0.0066578	0.0034	0.0075	0.0318	5.1721
0.0238482	0.00002	3E-05	0.0058754	0.0034	0.0075	0.0313	6.5257
0.0239289	0.00002	3E-05	0.00501	0.0034	0.0075	0.0307	8.8205
0.024092	0.00002	3E-05	0.0047483	0.0034	0.0075	0.0307	9.812
0.0239695	0.00002	3E-05	0.0043821	0.0034	0.0075	0.0304	11.398
0.0236884	0.00002	3E-05	0.0039904	0.0034	0.0075	0.0299	13.534
0.0236093	0.00002	3E-05	0.0037037	0.0034	0.0075	0.0297	15.596
0.0237282	0.00002	3E-05	0.0034247	0.0034	0.0075	0.0297	18.224
0.0233752	0.00002	3E-05	0.0032468	0.0034	0.0075	0.0293	20.005
0.02357	0.00002	3E-05	0.003034	0.0034	0.0075	0.0294	22.975
0.02357	0.00002	3E-05	0.0028441	0.0034	0.0075	0.0293	26.076
0.0235306	0.00002	3E-05	0.0027174	0.0034	0.0075	0.0292	28.484
0.02357	0.00002	3E-05	0.00251	0.0034	0.0075	0.0292	33.34
0.0236488	0.00002	3E-05	0.002451	0.0034	0.0075	0.0292	35.028
0.02357	0.00002	3E-05	0.0023946	0.0034	0.0075	0.0291	36.593
0.0234527	0.00002	3E-05	0.0023256	0.0034	0.0075	0.029	38.617
0.0232599	0.00002	3E-05	0.0022262	0.0034	0.0075	0.0288	41.844
UTavg/Tavg	U/lif	Uw/v	Umic/Vmic	UG/G	US/S	URs/Rs	URs

SUD	2	0.65																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltat(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Re	phi
1	676	711	0.10334	6.16724	28.8	24	4.8	26.4	0.0261121	10.6488	346.928	1.57E-05	0.0095	0.174647	0.038871	2729.155	83.244	6.822887
2	676	971	0.12031	7.17964	29.2	24.2	5	26.7	0.0261341	13.843	347.102	1.57E-05	0.013	0.238632	0.038852	2724.327	166.14	6.810817
3	676	1057	0.13839	8.25858	29.7	24.2	5.5	26.95	0.0261523	16.6395	347.247	1.57E-05	0.0141	0.259875	0.038836	2720.314	183.72	6.800786
4	676	1096	0.15763	9.40665	31.3	24.4	6.9	27.85	0.026218	17.165	347.767	1.58E-05	0.0147	0.269868	0.038778	2705.95	197.07	6.764875
5	676	1214	0.17213	10.27210	32.1	24.6	7.5	28.35	0.0262544	18.8043	348.056	1.59E-05	0.0162	0.299171	0.038746	2698.024	241.48	6.74506
6	676	1361	0.18951	11.30960	32.7	25	7.7	28.65	0.0262909	22.1718	348.344	1.59E-05	0.0182	0.335675	0.038713	2690.136	303.12	6.725339
7	676	1615	0.20760	12.38890	32.7	24.8	7.9	28.75	0.0262836	26.8382	348.286	1.59E-05	0.0216	0.398255	0.03872	2691.71	426.92	6.729276
8	676	1924	0.22366	13.34720	32.7	24.8	7.9	28.75	0.0262836	30.1073	348.286	1.59E-05	0.0257	0.474453	0.03872	2691.71	605.92	6.729276
9	676	2040	0.24063	14.35970	33.6	24.9	8.7	29.25	0.02632	31.6001	348.575	1.6E-05	0.0273	0.503475	0.038688	2683.852	680.32	6.709631
10	676	2148	0.25806	15.40030	35.1	25	10.1	30.05	0.0263782	31.2388	349.035	1.6E-05	0.0287	0.53083	0.038637	2671.358	762.74	6.678396
11	676	2348	0.25806	15.40030	34.6	25	9.6	29.8	0.02636	32.8885	348.892	1.6E-05	0.0314	0.580017	0.038653	2675.252	900.01	6.688132
12	676	862	0.10357	6.18069	29	24.8	4.2	26.9	0.0261487	12.2061	347.218	1.57E-05	0.0115	0.211915	0.038839	2721.116	122.2	6.802791
13	676	1071	0.12051	7.19182	29	25.1	3.9	27.05	0.0261596	17.7804	347.304	1.57E-05	0.0143	0.263361	0.038829	2718.712	188.57	6.796781
14	676	1323	0.13851	8.26587	29.6	25.1	4.5	27.35	0.0261815	20.3604	347.478	1.58E-05	0.0177	0.325491	0.03881	2713.915	287.52	6.784787
15	676	1422	0.15608	9.31402	30.2	25.1	5.1	27.65	0.0262034	22.7788	347.651	1.58E-05	0.019	0.350022	0.038791	2709.131	331.91	6.772829
16	676	1888	0.17278	10.31110	29.8	25.1	4.7	27.45	0.0261888	30.3109	347.536	1.58E-05	0.0252	0.464572	0.038803	2712.319	566.38	6.780797
17	676	1368	0.16384	9.76535	31	25.1	5.9	28.05	0.0262326	21.6216	347.882	1.58E-05	0.0183	0.336954	0.038765	2702.775	306.87	6.756938
18	676	1446	0.15873	9.47239	31	25.2	5.8	28.1	0.0262362	20.6916	347.911	1.58E-05	0.0193	0.356196	0.038762	2701.982	342.82	6.754956
19	676	1668	0.17326	10.33929	30.6	25.2	5.4	27.9	0.0262216	26.483	347.796	1.58E-05	0.0223	0.410745	0.038774	2705.156	456.39	6.762889
20	676	1921	0.18183	10.85086	30.5	25.2	5.3	27.85	0.026218	28.7342	347.767	1.58E-05	0.0257	0.473007	0.038778	2705.95	605.42	6.764875

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.1473	0.000268	0.0001	4E-04	0.1477	1.5723
0.1414	0.00026	0.0001	4E-04	0.1418	1.9626
0.1286	0.000253	0.0001	4E-04	0.129	2.1457
0.1025	0.000248	0.0001	4E-04	0.103	1.7674
0.0943	0.000245	0.0001	4E-04	0.0948	1.7828
0.0918	0.000242	0.0001	4E-04	0.0924	2.0481
0.0895	0.000239	0.0001	4E-04	0.0901	2.3362
0.0895	0.000237	0.0001	4E-04	0.0901	2.7116
0.0813	0.000235	0.0001	4E-04	0.0819	2.5878
0.07	0.000233	0.0001	4E-04	0.0707	2.2093
0.0737	0.000233	0.0001	4E-04	0.0743	2.4447
0.1684	0.000268	0.0001	4E-04	0.1687	2.0586
0.1813	0.00026	0.0001	4E-04	0.1816	3.2304
0.1571	0.000253	0.0001	4E-04	0.1575	3.2042
0.1386	0.000248	0.0001	4E-04	0.139	3.1666
0.1504	0.000245	0.0001	4E-04	0.1508	4.5703
0.1198	0.000247	0.0001	4E-04	0.1203	2.6003
0.1219	0.000248	0.0001	4E-04	0.1223	2.5311
0.1309	0.000245	0.0001	4E-04	0.1313	3.4792
0.1334	0.000243	0.0001	4E-04	0.1338	3.9782
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/f	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0267841	0.00002	3E-05	0.0070323	0.0034	0.0075	0.0344	2.8663
0.0264831	0.00002	3E-05	0.0051493	0.0034	0.0075	0.0328	5.0933
0.0262375	0.00002	3E-05	0.0047304	0.0034	0.0075	0.0324	5.9484
0.0253896	0.00002	3E-05	0.004562	0.0034	0.0075	0.0316	6.2267
0.0249418	0.00002	3E-05	0.0041186	0.0034	0.0075	0.031	7.4836
0.0245095	0.00002	3E-05	0.0036738	0.0034	0.0075	0.0304	9.2197
0.0245948	0.00002	3E-05	0.003096	0.0034	0.0075	0.0302	12.905
0.0245948	0.00002	3E-05	0.0025988	0.0034	0.0075	0.03	18.201
0.0241744	0.00002	3E-05	0.002451	0.0034	0.0075	0.0296	20.169
0.0235308	0.00002	3E-05	0.0023277	0.0034	0.0075	0.0291	21.892
0.0237282	0.00002	3E-05	0.0021295	0.0034	0.0075	0.0292	26.264
0.0262862	0.00002	3E-05	0.0058005	0.0034	0.0075	0.0331	4.0455
0.0261405	0.00002	3E-05	0.0046685	0.0034	0.0075	0.0323	6.0839
0.0258537	0.00002	3E-05	0.0037793	0.0034	0.0075	0.0316	9.0741
0.0255732	0.00002	3E-05	0.0035162	0.0034	0.0075	0.0312	10.358
0.0257596	0.00002	3E-05	0.0026483	0.0034	0.0075	0.031	18.157
0.0252086	0.00002	3E-05	0.003655	0.0034	0.0075	0.031	9.5047
0.0251637	0.00002	3E-05	0.0034578	0.0034	0.0075	0.0308	10.575
0.0253441	0.00002	3E-05	0.0029976	0.0034	0.0075	0.0308	14.057
0.0253896	0.00002	3E-05	0.0026028	0.0034	0.0075	0.0307	18.583
UTavg/Tavg	U/f	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Svd	2	0.60000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	k(V/m/K)	Nu	c (m/s)	v (m²/s)	PR	epsilon	X	N²	Rs	phi
1	723	1000	0.10364	6.18548	25.1	22.2	2.9	23.65	0.025911	17.8666	345.332	1.54E-05	0.0134	0.228611	0.041766	2966.947	166.06	7.417368
2	723	1243	0.12092	7.21676	25.9	22.4	3.5	24.15	0.0259476	20.122	345.623	1.55E-05	0.0166	0.284403	0.041731	2958.115	239.27	7.395288
3	723	1520	0.13769	8.21780	26.1	22.4	3.7	24.25	0.0259549	24.6741	345.681	1.55E-05	0.0203	0.34784	0.041724	2956.354	367.7	7.390885
4	723	1654	0.15603	9.31248	27.2	22.7	4.5	24.95	0.0260061	28.0012	346.088	1.56E-05	0.0221	0.37895	0.041675	2944.074	422.78	7.360186
5	723	1768	0.17211	10.27234	28.8	23.5	5.3	26.15	0.0260939	28.7717	346.783	1.57E-05	0.0236	0.405883	0.041591	2923.218	481.57	7.308045
6	723	1957	0.18948	11.30900	29.3	23.7	5.6	26.5	0.0261195	30.6794	346.986	1.57E-05	0.0262	0.449535	0.041567	2917.181	568.61	7.292952
7	723	2026	0.20689	12.34790	30.4	23.7	6.7	27.05	0.0261596	30.6233	347.304	1.57E-05	0.0271	0.465811	0.041528	2907.735	630.82	7.269338
8	723	2092	0.22363	13.34720	31.6	23.8	7.8	27.7	0.026207	30.6787	347.68	1.58E-05	0.028	0.481506	0.041484	2896.637	671.58	7.241592
9	723	2334	0.24128	14.40030	31.9	24	7.9	27.95	0.0262253	35.1184	347.825	1.58E-05	0.0312	0.53743	0.041467	2892.387	836.41	7.230967
10	723	2483	0.25802	15.39930	33.1	24	9.1	28.55	0.026269	34.8071	348.171	1.59E-05	0.0332	0.572308	0.041426	2882.229	944.03	7.205572
11	723	800	0.11171	6.66713	30.2	24	6.2	27.1	0.0261633	9.61481	347.333	1.58E-05	0.0107	0.183949	0.041526	2906.879	98.38	7.267197
12	723	982	0.12911	7.70582	30.8	24.2	6.6	27.5	0.0261925	12.0523	347.565	1.58E-05	0.0131	0.225947	0.041498	2900.044	148.05	7.250111
13	723	1252	0.14611	8.72031	30.5	24.3	6.2	27.4	0.0261852	16.4348	347.507	1.58E-05	0.0167	0.288024	0.041505	2901.75	240.72	7.254376
14	723	1435	0.16417	9.79841	29.8	24.3	5.5	27.05	0.0261596	23.4136	347.304	1.57E-05	0.0192	0.329931	0.041529	2907.735	316.52	7.269338
15	723	1675	0.18113	10.81040	31.1	24.3	6.8	27.7	0.026207	23.0086	347.68	1.58E-05	0.0224	0.385527	0.041484	2896.637	430.53	7.241592
16	723	1703	0.19763	11.79506	32.3	24.1	8.2	28.2	0.0262435	22.6838	347.969	1.59E-05	0.0228	0.392298	0.04145	2888.147	444.48	7.220368
17	723	1849	0.21572	12.87484	33.1	24.3	8.8	28.7	0.0262799	25.1494	348.258	1.59E-05	0.0247	0.426283	0.041415	2879.698	623.29	7.199246
18	723	1874	0.23247	13.87483	33.8	24.3	9.5	29.05	0.0263054	27.0284	348.459	1.59E-05	0.0264	0.455365	0.041391	2873.808	696.91	7.184521
19	723	2119	0.24853	14.83312	34.3	24.5	9.8	29.4	0.0263309	28.8174	348.661	1.6E-05	0.0283	0.489097	0.041367	2867.938	686.06	7.169846
20	723	2160	0.25915	15.46712	35.1	24.6	10.5	29.85	0.0263637	30.3232	348.92	1.6E-05	0.0289	0.498931	0.041337	2860.42	712.05	7.15105
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	k(V/m/K)	Nu	c (m/s)	v (m²/s)	PR	epsilon	X	N²	Rs	phi

Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu
0.2438	0.000268	0.0001	4E-04	0.244	4.3598
0.202	0.00026	0.0001	4E-04	0.2023	4.0702
0.1911	0.000254	0.0001	4E-04	0.1914	4.7219
0.1571	0.000248	0.0001	4E-04	0.1575	4.0939
0.1334	0.000245	0.0001	4E-04	0.1338	3.5818
0.1263	0.000242	0.0001	4E-04	0.1267	3.886
0.1055	0.000239	0.0001	4E-04	0.106	3.2358
0.0907	0.000237	0.0001	4E-04	0.0912	2.7889
0.0895	0.000235	0.0001	4E-04	0.0901	3.163
0.0777	0.000233	0.0001	4E-04	0.0783	2.727
0.114	0.000264	0.0001	4E-04	0.1145	1.1008
0.1071	0.000256	0.0001	4E-04	0.1076	1.2969
0.114	0.000251	0.0001	4E-04	0.1145	1.8816
0.1286	0.000247	0.0001	4E-04	0.129	3.0193
0.104	0.000243	0.0001	4E-04	0.1045	2.4037
0.0862	0.00024	0.0001	4E-04	0.0868	1.9692
0.0804	0.000238	0.0001	4E-04	0.081	2.0365
0.0744	0.000236	0.0001	4E-04	0.0751	2.03
0.0722	0.000234	0.0001	4E-04	0.0728	2.1793
0.0673	0.000233	0.0001	4E-04	0.0681	2.0645
Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs
0.0298985	0.00002	3E-05	0.005	0.0034	0.0075	0.0356	5.5137
0.0292795	0.00002	3E-05	0.0040225	0.0034	0.0075	0.0345	8.2624
0.0291588	0.00002	3E-05	0.0032895	0.0034	0.0075	0.0341	12.204
0.0283407	0.00002	3E-05	0.003023	0.0034	0.0075	0.0333	14.087
0.0270402	0.00002	3E-05	0.0028281	0.0034	0.0075	0.0321	15.482
0.026683	0.00002	3E-05	0.0025549	0.0034	0.0075	0.0318	18.721
0.0261405	0.00002	3E-05	0.0024679	0.0034	0.0075	0.0313	19.732
0.0255271	0.00002	3E-05	0.0023901	0.0034	0.0075	0.0307	20.644
0.0252987	0.00002	3E-05	0.0021422	0.0034	0.0075	0.0305	25.461
0.0247671	0.00002	3E-05	0.0020137	0.0034	0.0075	0.03	28.322
0.0260923	0.00002	3E-05	0.00625	0.0034	0.0075	0.0333	3.2734
0.0257127	0.00002	3E-05	0.0050916	0.0034	0.0075	0.0322	4.7638
0.0258066	0.00002	3E-05	0.0039936	0.0034	0.0075	0.0316	7.6131
0.0261405	0.00002	3E-05	0.0034843	0.0034	0.0075	0.0317	10.021
0.0255271	0.00002	3E-05	0.0029851	0.0034	0.0075	0.0309	13.324
0.0250745	0.00002	3E-05	0.002936	0.0034	0.0075	0.0306	13.581
0.0246376	0.00002	3E-05	0.0027042	0.0034	0.0075	0.0301	15.757
0.0243408	0.00002	3E-05	0.0025329	0.0034	0.0075	0.0298	17.763
0.024051	0.00002	3E-05	0.0023596	0.0034	0.0075	0.0295	20.249
0.0236884	0.00002	3E-05	0.0023148	0.0034	0.0075	0.0292	20.797
UTavg/Tavg	U/lff	Uw/v	Uvmic/Vmic	UG/G	US/S	URs/Rs	URs

Sud	2	0.65000																
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	dellat(C)	Tavg (C)	kV(m/k)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	W^2	Rs	phi
1	925	1123	0.10310	6.15347	27.6	24.1	3.5	25.85	0.026072	14.6586	346.61	1.56E-05	0.015	0.201408	0.053238	3746.581	151.98	9.396454
2	925	1364	0.12052	7.19309	28.5	24.3	4.2	26.4	0.0261121	16.6636	346.928	1.57E-05	0.0182	0.244856	0.053189	3734.42	223.9	9.336051
3	925	1577	0.13795	8.23313	29	24.4	4.6	26.7	0.0261341	19.7841	347.102	1.57E-05	0.0211	0.283234	0.053163	3727.814	289.05	9.319535
4	925	1697	0.15467	9.23136	29.8	24.6	5.2	27.2	0.0261706	21.9718	347.391	1.58E-05	0.0227	0.305041	0.053119	3716.847	345.85	9.292117
5	925	1770	0.17207	10.26994	31.1	24.6	6.5	27.65	0.026218	21.7167	347.767	1.58E-05	0.0237	0.318507	0.053061	3702.668	375.62	9.256671
6	925	1902	0.18902	11.28152	31.8	24.6	7.2	28.2	0.0262435	23.6337	347.969	1.59E-05	0.0254	0.342459	0.05303	3695.071	433.35	9.237677
7	925	1953	0.20620	12.30650	33.2	24.6	8.6	28.9	0.0262945	23.4894	348.373	1.59E-05	0.0261	0.352049	0.052969	3679.952	458.09	9.199881
8	925	2150	0.22452	13.40040	33.7	24.7	9	29.2	0.0263164	26.6022	348.546	1.59E-05	0.0287	0.387753	0.052943	3673.504	552.32	9.183761
9	925	970	0.09406	5.61365	29.1	25	4.1	27.05	0.0261596	10.3082	347.304	1.57E-05	0.013	0.174317	0.053132	3720.131	113.04	9.300329
10	925	856	0.08592	5.12814	28.7	25	3.7	26.85	0.026145	9.5386	347.189	1.57E-05	0.0114	0.153779	0.05315	3724.518	88.077	9.311296
11	925	1340	0.11172	6.66807	29	25.1	3.9	27.05	0.0261596	16.2817	347.304	1.57E-05	0.0179	0.240809	0.053132	3720.131	215.73	9.300329
12	925	1405	0.12889	7.69236	30.3	25.3	5	27.8	0.0262143	16.8402	347.738	1.58E-05	0.0188	0.252805	0.053066	3703.756	236.71	9.259393
13	925	1668	0.14610	8.71968	30.6	25.2	5.4	27.9	0.0262216	18.8408	347.796	1.58E-05	0.0223	0.300177	0.053057	3701.581	333.54	9.253954
14	925	1720	0.16282	9.71790	31.3	25.4	5.9	28.35	0.0262544	21.3916	348.056	1.58E-05	0.023	0.309766	0.053017	3691.822	354.25	9.228556
15	925	1799	0.17233	10.28507	32	25.4	6.6	28.7	0.0262799	21.3992	348.258	1.59E-05	0.024	0.324182	0.052986	3684.261	387.19	9.210654
16	925	1929	0.18158	10.83731	32.5	25.5	7	29	0.0263018	22.3828	348.431	1.59E-05	0.0258	0.347781	0.05296	3677.801	444.84	9.184503
17	925	1976	0.18973	11.32370	32.7	25.5	7.2	29.1	0.0263091	23.7614	348.488	1.59E-05	0.0264	0.356313	0.052951	3675.651	488.66	9.189129
18	925	2203	0.21596	12.88940	33.6	25.6	8	29.6	0.0263455	27.658	348.776	1.6E-05	0.0294	0.397575	0.052908	3664.935	579.3	9.162339
19	925	2052	0.20645	12.32190	33.8	25.9	7.9	29.85	0.0263637	26.6784	348.92	1.6E-05	0.0274	0.370476	0.052886	3659.597	502.29	9.148992
20	925	1894	0.19041	11.36410	34.5	25.7	8.8	30.1	0.0263819	19.6178	349.064	1.6E-05	0.0253	0.342092	0.052864	3654.271	427.65	9.135678

Ud/Tt	UVRVR	UVH/VH	Ukk	UNu/NU	UNu
0.202	0.000268	0.0001	4E-04	0.2023	2.9451
0.1684	0.00026	0.0001	4E-04	0.1687	2.7918
0.1637	0.000253	0.0001	4E-04	0.154	3.0476
0.136	0.000248	0.0001	4E-04	0.1363	2.9958
0.1088	0.000245	0.0001	4E-04	0.1092	2.3723
0.0982	0.000242	0.0001	4E-04	0.0987	2.3331
0.0822	0.000239	0.0001	4E-04	0.0828	1.9464
0.0786	0.000237	0.0001	4E-04	0.0792	2.107
0.1725	0.000274	0.0001	4E-04	0.1728	1.781
0.1911	0.00028	0.0001	4E-04	0.1914	1.8254
0.1813	0.000284	0.0001	4E-04	0.1816	2.7767
0.1414	0.000257	0.0001	4E-04	0.1418	2.2457
0.1309	0.000251	0.0001	4E-04	0.1313	2.4743
0.1198	0.000247	0.0001	4E-04	0.1203	2.5727
0.1071	0.000245	0.0001	4E-04	0.1076	2.3026
0.101	0.000243	0.0001	4E-04	0.1015	2.2721
0.0982	0.000242	0.0001	4E-04	0.0987	2.3447
0.0884	0.000238	0.0001	4E-04	0.089	2.4603
0.0895	0.000239	0.0001	4E-04	0.0901	2.3037
0.0804	0.000242	0.0001	4E-04	0.081	1.5804
Ud/Tt	UVRVR	UVH/VH	Ukk	UNu/NU	UNu

UTavg/Tavg	U/v	Umic/Vmic	UG/G	US/S	URe/Rs	URs
0.027354	3E-05	0.0044524	0.0034	0.0075	0.0331	5.036
0.0267841	3E-05	0.0036657	0.0034	0.0075	0.0323	7.2259
0.0264831	3E-05	0.0031706	0.0034	0.0075	0.0319	9.5135
0.0259963	3E-05	0.0029464	0.0034	0.0075	0.0313	10.832
0.0253896	3E-05	0.0028249	0.0034	0.0075	0.0308	11.559
0.0250745	3E-05	0.0026288	0.0034	0.0075	0.0304	13.193
0.0244671	3E-05	0.0025602	0.0034	0.0075	0.0299	13.647
0.0242158	3E-05	0.0023256	0.0034	0.0075	0.0296	16.37
0.0261405	3E-05	0.0051546	0.0034	0.0075	0.0326	3.6804
0.0263352	3E-05	0.0058411	0.0034	0.0075	0.0332	2.9218
0.0261405	3E-05	0.0037313	0.0034	0.0075	0.0318	6.8541
0.0254353	3E-05	0.0035587	0.0034	0.0075	0.0311	7.3648
0.0253441	3E-05	0.0029976	0.0034	0.0075	0.0308	10.273
0.0249418	3E-05	0.002907	0.0034	0.0075	0.0304	10.782
0.0246376	3E-05	0.0027793	0.0034	0.0075	0.0301	11.67
0.0243828	3E-05	0.002592	0.0034	0.0075	0.0299	13.284
0.024299	3E-05	0.0025304	0.0034	0.0075	0.0298	13.894
0.0238885	3E-05	0.0022696	0.0034	0.0075	0.0294	17.005
0.0236884	3E-05	0.0024366	0.0034	0.0075	0.0292	14.69
0.0234917	3E-05	0.0026399	0.0034	0.0075	0.0292	12.469
UTavg/Tavg	U/v	Umic/Vmic	UG/G	US/S	URe/Rs	URs

SUD		2		L (m)		0.65000													
#	f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TA(C)	deltaT(C)	Tavg (C)	K(W/mK)	Nu	c (m/s)	v (m²/s)	PR	epsilon	X	N²	Re	phi	
1	1202	1162	0.10288	6.14012	28.6	24.8	4	26.8	0.0261414	12.6508	347.16	1.57E-05	0.0155	0.160631	0.069071	4841.287	124.92	12.10322	
2	1202	1290	0.11157	6.65879	29.1	24.9	4.2	27	0.026156	14.1819	347.275	1.57E-05	0.0172	0.178385	0.069048	4835.584	153.87	12.08896	
3	1202	1455	0.12019	7.17328	29.4	25	4.4	27.2	0.0261706	16.6791	347.391	1.58E-05	0.0194	0.201269	0.069025	4829.891	195.65	12.07473	
4	1202	1532	0.12894	7.69549	29.7	25	4.7	27.35	0.0261815	18.8862	347.478	1.58E-05	0.0205	0.211973	0.069008	4825.629	216.83	12.06407	
5	1202	1633	0.13738	8.19945	30.2	25	5.2	27.6	0.0261997	17.3148	347.622	1.58E-05	0.0218	0.226042	0.06898	4818.54	246.2	12.04635	
6	1202	1703	0.14604	8.71593	30.6	25	5.6	27.8	0.0262143	18.1673	347.738	1.58E-05	0.0228	0.235809	0.068957	4812.88	267.63	12.0322	
7	1202	896	0.08630	5.15068	28.5	24.7	3.8	26.6	0.0261268	9.37886	347.044	1.57E-05	0.012	0.123819	0.069094	4847.002	74.31	12.11751	
8	1202	731	0.07727	4.61156	27.8	24.8	3	26.3	0.0261048	8.52806	346.87	1.57E-05	0.0098	0.100967	0.069129	4855.594	49.499	12.13899	
9	1202	1209	0.09466	5.64993	28.2	24.9	3.3	26.55	0.0261231	12.9927	347.015	1.57E-05	0.0162	0.167059	0.0691	4848.432	136.31	12.12108	
10	1202	1414	0.11209	6.68965	28.9	24.7	4.2	26.8	0.0261414	14.3016	347.16	1.57E-05	0.0189	0.185467	0.069071	4841.287	184.97	12.10322	
11	1202	1467	0.12022	7.17515	29.4	24.8	4.6	27.1	0.0261633	16.0094	347.333	1.58E-05	0.0196	0.202895	0.069037	4832.736	198.85	12.08184	
12	1202	1635	0.12903	7.70113	29.4	24.9	4.5	27.15	0.0261669	17.6724	347.362	1.58E-05	0.0219	0.226149	0.069031	4831.313	247.09	12.07828	
13	1202	1843	0.13745	8.20358	29.4	24.9	4.5	27.15	0.0261669	20.0636	347.362	1.58E-05	0.0246	0.254919	0.069031	4831.313	313.96	12.07828	
14	1202	1377	0.13745	8.20352	31.3	25.1	6.2	28.2	0.0262435	14.6124	347.969	1.59E-05	0.0184	0.190796	0.068911	4801.594	174.79	12.00399	
15	1202	1209	0.12877	7.68528	31.6	24.8	6.8	28.2	0.0262435	11.6129	347.969	1.59E-05	0.0162	0.167518	0.068911	4801.594	134.74	12.00399	
16	1202	1049	0.12110	7.22751	31.7	24.7	7	28.2	0.0262435	9.9772	347.969	1.59E-05	0.014	0.145348	0.068911	4801.594	101.44	12.00399	
17	1202	885	0.11159	6.66036	31.4	24.7	6.7	28.05	0.0262326	8.85686	347.882	1.58E-05	0.0118	0.122594	0.068928	4805.822	72.228	12.01455	
18	1202	625	0.10297	6.14551	30.7	24.7	6	27.7	0.026207	8.42748	347.68	1.58E-05	0.0084	0.086528	0.068968	4815.709	36.056	12.03927	
19	1202	1240	0.11544	6.88965	30.2	24.8	5.4	27.5	0.0261925	11.7754	347.565	1.58E-05	0.0166	0.171614	0.068991	4821.373	142	12.05343	
20	1202	1392	0.13304	7.94011	30.7	24.9	5.8	27.8	0.0262143	14.5491	347.738	1.58E-05	0.0186	0.192746	0.068957	4812.88	178.8	12.0322	

Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu
0.1768	0.000268	0.0001	4E-04	0.1771	2.2399
0.1684	0.000284	0.0001	4E-04	0.1687	2.3885
0.1607	0.00026	0.0001	4E-04	0.161	2.5246
0.1504	0.000257	0.0001	4E-04	0.1508	2.5461
0.136	0.000254	0.0001	4E-04	0.1363	2.3609
0.1263	0.000251	0.0001	4E-04	0.1267	2.2999
0.1861	0.00028	0.0001	4E-04	0.1863	1.7472
0.2357	0.000288	0.0001	4E-04	0.2359	2.2478
0.2143	0.000273	0.0001	4E-04	0.2145	2.787
0.1684	0.000284	0.0001	4E-04	0.1687	2.412
0.1537	0.00026	0.0001	4E-04	0.154	2.3121
0.1571	0.000256	0.0001	4E-04	0.1575	2.7826
0.1571	0.000254	0.0001	4E-04	0.1575	3.1575
0.114	0.000254	0.0001	4E-04	0.1145	1.6615
0.104	0.000257	0.0001	4E-04	0.1045	1.2132
0.101	0.00026	0.0001	4E-04	0.1015	1.0128
0.1055	0.000264	0.0001	4E-04	0.106	0.9388
0.1179	0.000268	0.0001	4E-04	0.1183	0.9968
0.1309	0.000262	0.0001	4E-04	0.1313	1.5464
0.1219	0.000255	0.0001	4E-04	0.1223	1.7797
Ud/Tt	UVR/R	UVH/VH	Uk/k	UNu/NU	UNu

UTavg/Tavg	U/lff	U/v/v	Uvmic/Vmic	UG/G	US/S	URS/Rs	URs
0.0263843	0.00002	3E-05	0.0043029	0.0034	0.0075	0.0323	4.0297
0.0261889	0.00002	3E-05	0.003876	0.0034	0.0075	0.0319	4.9057
0.0259963	0.00002	3E-05	0.0034364	0.0034	0.0075	0.0315	6.167
0.0258537	0.00002	3E-05	0.0032637	0.0034	0.0075	0.0313	6.7929
0.0256196	0.00002	3E-05	0.0030618	0.0034	0.0075	0.0311	7.6454
0.0254353	0.00002	3E-05	0.002936	0.0034	0.0075	0.0309	8.2569
0.0265827	0.00002	3E-05	0.0055804	0.0034	0.0075	0.0332	2.4664
0.0268859	0.00002	3E-05	0.0068399	0.0034	0.0075	0.0344	1.7007
0.0266328	0.00002	3E-05	0.0041356	0.0034	0.0075	0.0324	4.3808
0.0263843	0.00002	3E-05	0.0035361	0.0034	0.0075	0.0319	5.8977
0.0260923	0.00002	3E-05	0.0034083	0.0034	0.0075	0.0316	6.284
0.0260442	0.00002	3E-05	0.0030581	0.0034	0.0075	0.0314	7.7594
0.0260442	0.00002	3E-05	0.002713	0.0034	0.0075	0.0313	9.8193
0.0250745	0.00002	3E-05	0.0036311	0.0034	0.0075	0.0309	5.3929
0.0250745	0.00002	3E-05	0.0041356	0.0034	0.0075	0.0311	4.1913
0.0250745	0.00002	3E-05	0.0047664	0.0034	0.0075	0.0315	3.1918
0.0252086	0.00002	3E-05	0.0056497	0.0034	0.0075	0.0321	2.3221
0.0255271	0.00002	3E-05	0.008	0.0034	0.0075	0.0343	1.2375
0.0257127	0.00002	3E-05	0.0040323	0.0034	0.0075	0.0316	4.4827
0.0254353	0.00002	3E-05	0.003592	0.0034	0.0075	0.0311	5.566
UTavg/Tavg	U/lff	U/v/v	Uvmic/Vmic	UG/G	US/S	URS/Rs	URs

SUD		0.65000																
#	2	L (m)																
f (Hz)	Vmic (mV)	VR (V)	VH (V)	TH (C)	TAC(C)	deltaT(C)	Tavg (C)	k(W/mK)	Nu	c (m/s)	v (m^2/s)	PR	epsilon	X	N^2	Rs	phi	
1	1461	597	0.06907	4.12209	27.2	24.7	2.5	25.95	0.0260793	9.1443	346.668	1.56E-05	0.008	0.067801	0.084074	5914.073	27.187	14.78518
2	1461	948	0.08578	5.11959	28.3	25	3.3	26.65	0.0261304	10.665	347.073	1.57E-05	0.0127	0.10779	0.083976	5889.668	68.43	14.72417
3	1461	1013	0.10297	6.14534	29.9	25.3	4.6	27.6	0.0261997	10.9948	347.622	1.58E-05	0.0135	0.115363	0.083843	5856.811	77.846	14.64203
4	1461	1109	0.11178	6.67151	30.7	25.2	5.5	27.96	0.0262553	10.8272	347.825	1.58E-05	0.0148	0.126368	0.083794	5844.782	93.336	14.61195
5	1461	1293	0.12015	7.17098	30.8	25.5	5.3	28.15	0.0262399	12.9739	347.94	1.59E-05	0.0173	0.147384	0.083766	5837.926	126.81	14.59482
6	1461	506	0.07291	4.35139	28.5	25.5	3	27	0.026156	8.46872	347.275	1.57E-05	0.0068	0.057567	0.083927	5877.527	19.478	14.69382
7	1461	651	0.08149	4.86391	29.1	25.7	3.4	27.4	0.0261852	9.32369	347.507	1.58E-05	0.0087	0.074113	0.083871	5863.703	32.208	14.65926
8	1461	827	0.08985	5.36244	29.5	25.7	3.8	27.6	0.0261997	10.1343	347.622	1.58E-05	0.0111	0.094181	0.083843	5856.811	61.85	14.64203
9	1461	840	0.09459	5.64554	30.1	25.7	4.4	27.9	0.0262216	9.69281	347.796	1.58E-05	0.0112	0.095709	0.083801	5846.497	53.655	14.61624
10	1461	884	0.09889	5.90238	30.5	25.7	4.8	28.1	0.0262362	8.70651	347.911	1.58E-05	0.0118	0.100756	0.083773	5839.639	68.282	14.5991
11	1461	1017	0.11581	6.91716	31.9	25.8	6.1	28.85	0.0262909	10.4519	348.344	1.59E-05	0.0136	0.116059	0.083669	5814.036	78.313	14.53509
12	1461	1121	0.12642	7.54502	32.7	25.8	6.9	29.25	0.02632	10.9986	348.575	1.6E-05	0.015	0.128012	0.083614	5800.456	95.052	14.50114
13	1461	1242	0.13305	7.94086	33.3	25.7	7.6	29.5	0.0263382	11.0532	348.719	1.6E-05	0.0166	0.141888	0.083579	5791.995	116.61	14.47999
14	1461	1290	0.13735	8.19759	33.6	25.9	7.7	29.75	0.0263564	11.6184	348.863	1.6E-05	0.0172	0.147432	0.083545	5783.555	125.71	14.45889
15	1461	756	0.07855	4.68841	28.2	25.4	2.8	26.8	0.0261414	10.637	347.16	1.57E-05	0.0101	0.08598	0.083955	5884.46	43.602	14.71115
16	1461	1062	0.09482	5.65942	29	25.4	3.6	27.2	0.0261706	11.9283	347.391	1.58E-05	0.0142	0.120863	0.083899	5870.608	85.766	14.67652
17	1461	996	0.10229	6.10531	29.9	25.4	4.5	27.65	0.0262034	11.0917	347.651	1.58E-05	0.0133	0.113436	0.083836	5855.09	76.342	14.63773
18	1461	1142	0.11654	6.95545	31	25.4	5.6	28.2	0.0262335	11.5603	347.969	1.59E-05	0.0153	0.130183	0.083759	5836.214	88.91	14.59054
19	1461	1104	0.12382	7.39018	32.3	25.6	6.7	28.95	0.0262982	10.8758	348.402	1.59E-05	0.0148	0.126008	0.083655	5810.636	92.261	14.52659
20	1461	1198	0.13606	8.12083	32.9	25.5	7.4	29.2	0.0263164	11.8821	348.546	1.59E-05	0.016	0.136793	0.083621	5802.151	108.57	14.50538

Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu
0.2828	0.000297	0.0001	4E-04	0.283	2.588
0.2143	0.00028	0.0001	4E-04	0.2145	2.2877
0.1537	0.000268	0.0001	4E-04	0.154	1.6937
0.1286	0.000264	0.0001	4E-04	0.129	1.3962
0.1334	0.00026	0.0001	4E-04	0.1338	1.7358
0.2357	0.000292	0.0001	4E-04	0.2359	1.9974
0.208	0.000284	0.0001	4E-04	0.2082	1.9413
0.1861	0.000277	0.0001	4E-04	0.1863	1.885
0.1607	0.000273	0.0001	4E-04	0.161	1.5607
0.1473	0.000271	0.0001	4E-04	0.1477	1.4332
0.1159	0.000262	0.0001	4E-04	0.1164	1.2161
0.1025	0.000257	0.0001	4E-04	0.103	1.1325
0.093	0.000255	0.0001	4E-04	0.0936	1.0343
0.0818	0.000254	0.0001	4E-04	0.0824	1.0733
0.2525	0.000286	0.0001	4E-04	0.2527	2.6631
0.1964	0.000273	0.0001	4E-04	0.1967	2.346
0.1571	0.000269	0.0001	4E-04	0.1575	1.7464
0.1263	0.000261	0.0001	4E-04	0.1267	1.463
0.1055	0.000258	0.0001	4E-04	0.106	1.153
0.0956	0.000254	0.0001	4E-04	0.0961	1.1416
Ud/T	UVRVR	UVH/VH	Uk/k	UNu/NU	UNu

U/Tavg/Tavg	U/Iff	U/vv	Uvmic/Vmic	U/G	U/S	U/S/Rs	U/Rs
0.0272486	0.00002	3E-05	0.0083752	0.0034	0.0075	0.036	0.9778
0.0266328	0.00002	3E-05	0.0052743	0.0034	0.0075	0.033	2.2548
0.0256196	0.00002	3E-05	0.0049358	0.0034	0.0075	0.032	2.4946
0.0252987	0.00002	3E-05	0.0045086	0.0034	0.0075	0.0315	2.9394
0.025119	0.00002	3E-05	0.003867	0.0034	0.0075	0.031	3.9316
0.0261889	0.00002	3E-05	0.0098814	0.0034	0.0075	0.0367	0.7148
0.0258066	0.00002	3E-05	0.0076805	0.0034	0.0075	0.0342	1.1028
0.0256196	0.00002	3E-05	0.0060459	0.0034	0.0075	0.0328	1.7017
0.0253441	0.00002	3E-05	0.0059524	0.0034	0.0075	0.0325	1.7391
0.0251637	0.00002	3E-05	0.0056561	0.0034	0.0075	0.0321	1.9041
0.0245095	0.00002	3E-05	0.0049164	0.0034	0.0075	0.0311	2.4363
0.0241744	0.00002	3E-05	0.0044603	0.0034	0.0075	0.0306	2.9056
0.0239695	0.00002	3E-05	0.0040258	0.0034	0.0075	0.0302	3.5172
0.0237681	0.00002	3E-05	0.003876	0.0034	0.0075	0.0299	3.7619
0.0263843	0.00002	3E-05	0.0066138	0.0034	0.0075	0.0338	1.4698
0.0259963	0.00002	3E-05	0.0047081	0.0034	0.0075	0.0322	2.7588
0.0255732	0.00002	3E-05	0.0050201	0.0034	0.0075	0.032	2.4124
0.0250745	0.00002	3E-05	0.0043783	0.0034	0.0075	0.0312	3.0898
0.0244249	0.00002	3E-05	0.004529	0.0034	0.0075	0.0308	2.8423
0.0242158	0.00002	3E-05	0.0041736	0.0034	0.0075	0.0304	3.3048
U/Tavg/Tavg	U/Iff	U/vv	Uvmic/Vmic	U/G	U/S	U/S/Rs	U/Rs

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